



425 S. Palos Verdes Street Post Office Box 151 San Pedro, CA 90733-0151 TEL/TDD 310 SEA-PORT [www.portoflosangeles.org](http://www.portoflosangeles.org)

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March 1, 2017

Douglas Bautista  
Unit Supervisor  
Attention: Joseph Cully, Project Manager  
Brownfields & Environmental Restoration Program  
Department of Toxic Substances Control  
5796 Corporate Avenue  
Cypress, CA 90630

Dear Mr. Bautista:

**SUBJECT: REVISED REMOVAL ACTION WORKPLAN FOR FORMER SAN PEDRO  
BOAT WORKS, BERTH 44, MINER STREET, SAN PEDRO, CALIFORNIA  
(DOCKET NO. HSA-FY15/16-046, ENVIROSTOR ID NO. 70000023, SITE  
CODE 401270)**

Enclosed is the Revised Removal Action Workplan (RAW) for the above-referenced Site for your review. This Revised RAW incorporates comments from the Department of Toxic Substances Control (DTSC) dated September 29, 2016, and January 30, 2017, and the United States Environmental Protection Agency (U.S. EPA) dated September 19, 2016. The Revised RAW is submitted as required under the Imminent and Substantial Endangerment and Remedial Action Order for the former San Pedro Boat Works.

If you have any questions, please contact Pauling Sun at (310) 732-0335 or via email at [psun@portla.org](mailto:psun@portla.org).

Sincerely,

CHRISTOPHER CANNON  
Director of Environmental Management

CC:LW:SS:PS:mx  
APP No.: 920130-503

Enclosure

cc: Joseph Cully, DTSC  
George Randell, U.S. EPA (e-mail only)

**REVISED FINAL  
REMOVAL ACTION WORKPLAN**

**FOR**

**FORMER SAN PEDRO BOAT WORKS  
MINER STREET, BERTH 44  
SAN PEDRO, CALIFORNIA**

**FEBRUARY 2017**

**ADP# 920130-503**

**TC43245.23**

**PREPARED BY:**


Tetra Tech, Inc.  
3475 East Foothill Blvd.  
Pasadena, California 91107

**PREPARED FOR:**

City of Los Angeles Harbor Department  
Environmental Management Division  
425 S. Palos Verdes Street  
San Pedro, CA 90731

  
Heather Benfield, P.E.  
Project Manager



  
Robert Sabater  
Senior Scientist

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## LIST OF ABBREVIATIONS AND ACRONYMS

Al	aluminum
ARAR	Applicable or Relevant and Appropriate Requirements
B(a)P	benzo(a)pyrene
bgs	below ground surface
BTV	background threshold value
CalEPA	California Environmental Protection Agency
Cal-OSHA	California Division of Occupational Safety and Health
CCC	Continuous concentration criterion
CFR	Code of Federal Regulations
CHHSL	California Human Health Screening Level
COC	compounds of concern
COP	California Ocean Plan
COPEC	chemicals of potential environmental concern
COPC	chemicals of potential concern
CTR	California Toxics Rule
DIPE	diisopropyl ether (DIPE),
DTSC	Department of Toxic Substances Control
EC	electrical conductivity
ECA	environmental compliance audit
EPA	Environmental Protection Agency
FS	Feasibility Study
HI	hazard index
HQ	hazard quotient
HHERA	human health and screening ecological risk assessment
HHRA	human health risk assessment
HSAA	Hazardous Substances Account Act
LACDPW	Los Angeles County Department of Public Works
LACFD	Los Angeles County Fire Department
LARWQCB	Los Angeles Regional Water Quality Control Board
LBP	lead-based paint
MCL	Maximum Contaminant Levels
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
µg/kg	micrograms per kilogram
MHHW	mean higher high water
MHLW	mean higher low water
MLHW	mean lower high water
MLLW	mean lower low water
mS/cm	milliSiemens per centimeter
MTBE	methyl tert butyl ether
NCP	National Contingency Plan
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
PEA	preliminary environmental assessment
PM <sub>10</sub>	particulate matter smaller or equal to 10 microns per SCAQMD Rule 403
POLA	Port of Los Angeles
ppt	parts per thousand
PRG	preliminary remediation goal

**LIST OF ABBREVIATIONS AND ACRONYMS (continued)**

PSA	preliminary site assessment
QA/QC	quality assurance/quality control
RACR	Remedial Action Completion Report
RAO	remedial action objective
RAP	remedial action plan
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
RL	reporting limit
RME	reasonable maximum exposure
RSL	residential screening level
SCAQMD	South Coast Air Quality Management District
SERA	screening ecological risk assessment
SPBW	San Pedro Boat Works
STLC	soluble threshold limit concentration
SVOC	semi-volatile organic compounds
SWRCB	State Water Resources Control Board
TCLP	toxicity characteristic leaching procedure
TDS	total dissolved solids
TPH	total petroleum hydrocarbons
TRPH	total recoverable petroleum hydrocarbons
TSDf	treatment, storage, and disposal facility
TTLC	total threshold limit concentration
$\mu\text{g}/\text{m}^3$	micrograms per cubic meter
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WET	waste extraction test

# SECTION 1

## INTRODUCTION

On behalf of the City of Los Angeles Harbor Department (Harbor Department) Environmental Management Division (EMD), Tetra Tech, Inc. (Tetra Tech) has prepared this Removal Action Workplan (RAW) for the former San Pedro Boat Works (SPBW or the “Site”) located at Berth 44 in the Port of Los Angeles, San Pedro, California. The Site is considered an Outer Harbor Berth within the Port of Los Angeles. Figure 1 presents the location of the Site.

### 1.1 REMOVAL ACTION PROCESS

The RAW process, including the regulatory background and the RAW objectives, is described in the following sections.

#### 1.1.1 REGULATORY BASIS FOR THE RAW

In 2015, the California Environmental Protection Agency (CalEPA) Department of Toxic Substances Control (DTSC) issued an Imminent and Substantial Endangerment and Remedial Action Order (RAO or Order) to the Harbor Department for the Site. The Order was issued to address the chemicals of concern (COCs) in soil that require remediation at the Site to achieve the cleanup goals for either unrestricted or restricted (industrial) land use. These COCs include antimony, arsenic, copper, lead, mercury, zinc, benzo(a)pyrene-equivalents, polychlorinated biphenyls (PCBs), and total petroleum hydrocarbons (TPH).

#### 1.1.2 OBJECTIVES OF THE RAW

The objectives of this RAW are to implement the selected remedial alternative (excavation and offsite disposal) identified in the 2014 Revised Feasibility Study (FS) to effectively reduce, to the extent feasible, the human health risks associated with the impacted soil at the Site and achieve the cleanup goals for unrestricted land use (Tetra Tech, 2014). This RAW presents a summary of the remedial alternatives that were evaluated in the 2014 FS and presents the recommended remedial action and sampling plan to confirm that the proposed unrestricted land use remedial goals are achieved.

#### 1.1.3 ELEMENTS OF THE RAW

This RAW is organized into the following sections:

- *Section 1 – Introduction:* provides an overview of the RAW (including objectives), a description of the Site, and a description of Site history, operations, and chemical usage.
- *Section 2 – Site Characterization:* provides a description of previous Site investigations, regional and Site geology, regional and Site hydrogeology, the nature and extent of contamination at the Site, and human health risk assessments (HHRAs) performed for the Site.
- *Section 3 – Removal Action Goals and Objectives:* presents the RAOs, applicable or relevant and appropriate requirements (ARARs), and removal goals.
- *Section 4 – Alternative Evaluation:* provides a description of the removal action alternatives identified as well as presents the evaluation/analysis/comparison and recommended alternative.

- *Section 5 – Removal Action Implementation:* provides a description of the removal action technical approach, pre-excavation activities, soil excavation and disposal, field variances, and the removal action completion report. Details of the Waste Management Plan (WMP) and Health and Safety Plan (HASP) are also provided.
- *Section 6 – Sampling and Analysis Plan:* presents the Sampling and Analysis Plan (SAP) that will be used during the removal action, detailing the confirmation sample requirements and sample collection procedures.
- *Section 7 – Public Participation:* provides a description of public participation requirements for the removal action process.
- *Section 8 – California Environmental Quality Act (CEQA) Documentation:* provides a description of CEQA process.
- *Section 9 – References:* lists applicable references used in preparing this RAW.

## 1.2 SITE DESCRIPTION

Since the 1920s, Berth 44 was operated as a commercial boat yard by various entities and by SPBW since 1932. The Site consists of 3.07 acres of land and 1.13 acres of water properties. The Site was used primarily for refurbishing commercial, private, and government vessels and contained a marine railway haul and launch system, supported by a 25-slip turntable yard, as well as buildings used for carpentry, welding, machining, and fiberglass work, as shown on Figure 2. Other services provided at the Site included sandblasting, painting, and electrical repairs. SPBW abandoned the facility in late November 2002 and filed for bankruptcy on December 13, 2002. The Bankruptcy Court returned ‘access control’ of the facility to the Harbor Department on June 10, 2003. In September 2003, the Harbor Department conducted a hazardous and non-hazardous waste removal that transported and disposed of 1,500 tons of non-hazardous spent sandblast waste, 127 lab-packed drums, 69 compressed gas cylinders, 11 car/marine batteries, and contaminated empty containers, under the enforcement action of LA County Fire Department (LACFD).

Potentially historical buildings are located at the Site and the Harbor Department is currently in the process of evaluating their significance. If these buildings remain onsite during remediation activities, then soil areas below the buildings requiring remediation will be inaccessible. These areas were included in the FS evaluation (Tetra Tech, 2014) and are included in this RAW; however, these areas will be addressed after the buildings are demolished.

### 1.2.1 SURFACE FEATURES

The topography of the Site is relatively flat with an elevation generally ranging from 7.57 to 13.3 feet above mean lower low water (MLLW) (less than 16 feet above mean sea level).

### 1.2.2 REGIONAL GEOLOGY

The Site is located at the southern margin of the Southwestern Structural Block of the Los Angeles Basin, near the Palos Verdes Hills (Yerkes, R.F. 1965). The Southwestern Structural Block is the seaward-most block located within Los Angeles Basin. The Site is regionally bounded to the north by the northwest trending Palos Verdes Fault Zone and bounded to the west, south, and east by the Pacific Ocean (SCEC Working Group C, 2001).

The southwestern block is juxtaposed to the offshore Continental Borderland geomorphic province. The Site is located near sea-level on the southeastern flank of the Palos Verdes Hills, with underlying lithology

consisting of an uplifted fault block, composed of Miocene marine sediments, middle Miocene Volcanic rocks, and Late Pleistocene Terrace deposits, as a result of the eustatic sea-level changes and recent tectonic activity in the region.

The Site vicinity is bounded 1.5 miles to the southwest by the northwest striking Cabrillo Fault, 3 miles to the northwest by the Gaffey Anticline-Syncline fold, to the west by the Palos Verdes Hills, 1.5 to 2 miles to the north and east by the Palos Verdes fault, and to the south by the Pacific Ocean. In general, surficial sediments in the area consist of Holocene or recent age marine and non-marine, gravel, sand, silt, and clay (CADWR, 1961).

### 1.2.3 REGIONAL HYDROGEOLOGY

The Site is located in the extreme southerly edge of the West Coast Basin on the southeast flank of the Palos Verdes Hills. The West Coast Basin, which is the seaward-most groundwater basin, is located within the Coastal Plain of Los Angeles County, and is approximately 25 miles long and 7.5 miles wide, encompassing an area of approximately 140 square miles, including 20 incorporated cities. The West Coast Basin is bounded by the Pacific Ocean on its southern and western boundaries, the Baldwin Hills and Ballona Escarpment to the north, and the Newport-Inglewood Uplift providing separation from the Central Basin to the east (SCEC Working Group C, 2001). The Quaternary aged (less than 1.8 million years old) sediments comprise the bulk of the water-bearing portions of the West Coast Basin and consist of gravel, sand, silt, and clay that were eroded from the nearby hills and mountains and deposited in riverbeds, beaches, and shallow marine environments in the recent past. Three distinct formation units are identified in the West Coast Basin (Recent alluvium, Lakewood Formation, and San Pedro Formation). Within these three units, five individual aquifers have been identified. From shallowest to deepest these aquifers include the Semi-perched and Gaspur (in the Recent alluvium), Gage (in the Lakewood Formation), and the Lynwood, Silverado, and the Sunnyside (in the San Pedro formation).

Except for the semi-perched Gaspur aquifer, all other identified aquifers in the West Coast Basin are confined systems and receive the majority of their natural recharge from groundwater underflow from adjacent basins and from continued seawater intrusion in portions of the Basin. Due to historic demand on the groundwater system, the lateral encroachment of seawater has been observed in the aquifers identified in the West Coast Basin. The greatest impact to groundwater quality in the West Coast Basin is, and has been, the encroachment of seawater in response to the extraction of groundwater in excess of the natural recharge (Johnson, 2004).

In the West Coast Basin, the dominant groundwater flow direction is controlled by the location of the Charnock Fault and groundwater withdrawal. The direction of flow in the Basin is influenced by the operation of two Los Angeles County Department of Public Works (LACDPW) seawater barrier projects (West Coast and Dominguez Gap). These seawater barrier projects are used to combat the lateral movement of seawater landward by the creation of high-pressure ridges emplaced through the injection of fresh water (Reichard et al., 2003). Since groundwater in this portion of Los Angeles County is seaward of the LACDPW seawater intrusion barrier and is saline, it is not suitable for municipal purposes. Furthermore, the groundwater in the Site and vicinity has been de-designated from beneficial use as a drinking water source by the Los Angeles Regional Water Quality Control Board (LARWQCB Order 98-018, November 1998).

### 1.2.4 SITE GEOLOGY

Subsurface investigations have been conducted and were used to identify the Site geology and hydrogeology. Summaries of the subsurface investigations are provided in *Section 2.2*. Tetra Tech conducted the Preliminary Environmental Assessment (PEA) in 2006 which included drilling 53 soil borings and the Remedial Investigation (RI) in July 2007 which included drilling 32 soil borings and

installing eight groundwater monitoring wells. Results from the 2006 PEA and 2007 RI indicated the top 3 to 5 feet of the subsurface soils at the Site consist of silt, silty sands, and sands underlain by a 2 to 8 foot thick finer grained layer of clayey silt or clay. The fine-grained section of silty clay and clay layers are underlain by 2 to 4 foot thick alternating layers of silt, silty sand, and sand to a maximum depth of 20 or 21.5 feet below ground surface (bgs). In monitoring well locations SPBW-GW1 and SPBW-GW2, located in the northern section of the Site, these alternating layers are underlain by a plastic clay layer. Fill material (wood debris) was encountered in the top 1 to 2 feet in two boreholes, TtSPBW-27 (turntable) and TtSPBW-47 (electrical shop), and from 3 to 8 feet bgs in two boreholes, SPBW-RI-S27 and SPBW-RI-S26 (electric shop). Construction debris was encountered in the top 2 feet in one borehole, SPBW-GW2 (machine shop), and in the top 8 feet in two locations, SPBW-GW5 and SPBW-RI-S26. Shell fragments were observed in the majority of the boring locations in the subsurface soil below 2.5 feet bgs. Tetra Tech's boring logs are presented in the PEA and RI Reports (Tetra Tech 2006, 2008).

The observations made during the PEA and RI are consistent with the available EnecoTech boring logs generated from the April 1997 and 1999 investigations, which indicated the top 2.5 to 3 feet of the subsurface soil in the eastern section of the Site (paint shop area) contained some artificial materials such as wood debris and coal fragments. EnecoTech observed that soils consisted of sandy silts and sandy clays to their investigated depth of 5 feet bgs.

### 1.2.5 SITE HYDROGEOLOGY

The formation of specific interest for the Site is the Recent alluvium, which consists, in order of increasing depth, an un-named aquifer, an un-named aquiclude, and the Gaspar aquifer. Extensive seawater intrusion has been documented in the Gaspar aquifer, suggesting open communication with the Pacific Ocean (CADWR, 1961).

Groundwater was not encountered in any of the borings drilled to a total depth of five feet bgs during the 1997 and 1999 EnecoTech investigations. However, during Tetra Tech's 2006 PEA and the 2007 RI, groundwater was encountered in 90 boring locations drilled at the Site. During drilling, the shallowest depth to groundwater was 3.5 feet bgs encountered at boring TtSPBW-25 (within the turntable area) and at boring TtSPBW-52 (outside turntable area). The deepest depth to groundwater was at 13.5 feet bgs encountered in borings TtSPBW-42/-56, TtSPBW-44, and SPBW-RI-S29.

During groundwater sampling and tidal study activities for the RI (July and August 2007), groundwater quality parameters including temperature, salinity, electrical conductivity (EC), pH, and dissolved oxygen were collected and are provided in the RI Report. The groundwater beneath the Site ranged in salinity from 0.3 percent (%), 3.0 parts per thousand [ppt], in SPBW-GW1, SPBW-GW2, and SPBW-GW6) to 1.2% (12.0 ppt in SPBW-GW8) with an average salinity of 0.612% (6.12 ppt), within the range of brackish conditions (greater than the upper bound for freshwater of 0.1%, but lower than the lower bound for saline water of 2.5%). In addition, total dissolved solids (TDS) ranged from 3,200 milligrams per liter (mg/L) to 16,000 mg/L, exceeding the LARWQCB's drinking water criterion of 3,000 mg/L of TDS. Groundwater EC ranged from 5.33 to 25.8 milliSiemens per centimeter (mS/cm). Altogether, these factors indicate that the water beneath the Site is brackish.

The Site is bounded to the west by the West Channel and to the south by the Outer Harbor. Tetra Tech conducted a 72-hour tidal influence study during the RI from August 7 to August 9, 2007. Composite groundwater hydrograph and groundwater elevation/flow direction maps were generated using the groundwater elevations collected during two complete tidal cycles of the tidal study. The groundwater elevation maps show that both the flow direction and gradient of the Site groundwater are affected by the tides, which is expected given that the Site is directly adjacent to the West Channel. During mean lower low water (MLLW), groundwater flows outward from the Site in a westerly direction towards the West Channel; however in the northern section of the Site, groundwater flows northwesterly and in the southern

section of the Site, groundwater flows southwesterly. During mean lower high water (MLHW) and mean higher low water (MHLW), groundwater flows inward from the channel, towards the east and southeast respectively. During mean higher high water (MHHW), groundwater flows inward from the West Channel, towards the east; however in the northern section of the Site, groundwater flows southeasterly and at the southern section of the Site, groundwater flows northeasterly.



## SECTION 2

### SITE CHARACTERIZATION

#### 2.1 PREVIOUS ENVIRONMENTAL ASSESSMENTS

Several investigations have been conducted at the Site since 1994. These include soil investigations conducted by EnecoTech (1997 and 2001) and assessments/audits and investigations conducted by Tetra Tech (1994, 2002, 2006, 2008, and 2016). A summary of the past investigations conducted at the Site are briefly described below. Sampling and groundwater well locations from these studies are shown on Figure 3. The investigation analytical results including locations with concentrations exceeding the Site cleanup goals are provided in the Revised Feasibility Study, dated May 16, 2014. A hard copy has been provided to DTSC and it has been uploaded to the Envirostor Database by DTSC.

##### 2.1.1 Summary of Pre-2006 Environmental Assessments

Tetra Tech conducted a Preliminary Site Assessment (PSA) and Environmental Compliance Audit (ECA) of the Site in 1994 and a Supplemental ECA in 2002 on behalf of the Harbor Department, primarily to assess the compliance status of SPBW's environmental permits, records, and housekeeping operations. Several deficiencies ranging from outdated permits, unauthorized sewage discharge, to improper storage of spent sandblast waste were documented and communicated to the SPBW management.

In 1997, EnecoTech, contracted by SPBW, drilled and sampled 12 shallow soil borings at the Site which identified elevated copper, lead, and mercury in a 1 foot sample of one boring (B3). EnecoTech conducted another soil assessment in 2001 by drilling and sampling seven shallow soil borings. Elevated concentrations of metals and total recoverable petroleum hydrocarbons (TRPH) were detected in the paint shop and winch house areas, respectively.

##### 2.1.2 Summary of the 2006 PEA Investigation

The PEA conducted in 2006 collected soil, soil gas, groundwater, ambient air, and surface water samples to evaluate and establish the nature and quantity of hazardous substances on Site. Fifty-nine boring locations (by Geoprobe® drilling and hand-augering) were drilled throughout the Site for soil, soil-vapor, and groundwater collection. Seventeen borings were completed for groundwater collection and 18 borings had soil vapor probes installed. Among the 59 locations, three borings were drilled in the area directly north of the Site as potential background soil conditions (TtBCK). This area was outside the leased boundary of SPBW and used for parking. In addition, four boreholes were drilled only for collection of grab groundwater samples. A total of 213 soil samples, 18 soil gas, 21 groundwater samples, and two surface water samples were collected and selectively analyzed for metal and chemical compounds. The PEA sampling locations are presented on Figure 3.

Soil and groundwater samples were selectively analyzed for Title 22 Metals via EPA Methods 6010B/7471A, volatile organic compounds (VOCs) via EPA Method 8260B, organotins by the Krone method, polynuclear aromatic hydrocarbons (PAHs) via EPA Method 8310, semi-volatile organic compounds (SVOCs) via EPA Method 8270, and polychlorinated biphenyls (PCBs) via EPA Method 8082. In addition, approximately 20% of the samples (24 total) were analyzed for hexavalent chromium via EPA Method 7199 based upon the distribution of total chromium concentrations. Upon request of DTSC, one soil sample, TtSPBW-26-0.5, was analyzed for dioxins and furans congeners via EPA Method 8280B. Groundwater samples were filtered and unfiltered for Title 22 Metal analysis.

Regulatory screening criteria utilized in the PEA for soil consisted of the 2004 United States Environmental Protection Agency (USEPA) residential and industrial preliminary remediation goals (PRGs) and the 2005

California human health screening levels (CHHSLs). Regulatory screening criteria utilized for groundwater consisted of the 2005 California Ocean Plan ([COP], 2005) and the 2000 California Toxics Rule (CTR). Two CTR criteria were utilized: the continuous concentration criterion ([CCC], 4-day average), protective of marine aquatic organisms and the human health (30-day average) criterion protective of aquatic organism consumption by humans. The COP criterion utilized is the criterion protective of marine aquatic life, based on a 6-month median level of exposure.

PEA results indicated that the concentrations of several constituents (metals, organotins, PAHs, and PCBs) in surface and subsurface soils, PCBs in ambient air, and metals in groundwater beneath the Site exceeded regulatory screening criteria. VOCs were not detected in any soil gas samples and hexavalent chromium was not detected at concentrations exceeding its respective screening criterion. In groundwater, VOCs, organotins, PAHs, PCBs, and SVOCs did not exceed the screening criteria. TPH was detected in three samples, but no screening criteria had been established as the components within TPH such as benzene are more toxic and have well established criteria. Several metals including arsenic, chromium, copper, lead, mercury, nickel, and zinc were detected in filtered groundwater at concentrations above the screening criteria. Only three metals (chromium, vanadium, and zinc) were detected in harbor water samples collected near the Site; at least one measured value of each detected metal exceeded screening criteria protective of aquatic biota.

Since several organic and inorganic compounds exceeded regulatory screening criteria, a remedial investigation (RI) was conducted.

### **2.1.3 Summary of the 2007 RI Investigation**

Tetra Tech conducted a RI in 2007 in order to further delineate soil contamination, confirm the presence or absence of groundwater contaminants, and determine the tidal influence on groundwater at the Site (as described in *Section 1.2.5*). Soil samples were collected mainly from the depths of 0.5 foot, 2.5 feet, 4 feet, 7 feet, 8 feet and/or 10 feet bgs, depending on the depth of groundwater. In some cases, soil samples were collected from the depths of 1 foot, 3 feet, 5 feet, 7.5 feet bgs, based on field observations made by the field geologist. Thirty-two soil borings were drilled and 131 soil samples were collected for metal and chemical analyses. Eight groundwater monitoring wells were constructed and nine groundwater samples (including one duplicate) were collected for metal and chemical analyses. RI sample locations are presented on Figure 3.

Soil samples were selectively analyzed for pre-determined Title 22 metals (antimony, arsenic, copper, lead, thallium, and mercury) via EPA Method 6010B/7147A, PAHs via EPA Method 8310, PCBs via EPA Method 8082, and organotins (mono-, di-, tri-, and tetrabutyltin) by the Krone method, the same analytical methods utilized in the PEA. Groundwater samples were analyzed for Title 22 Metals (filtered and unfiltered), VOCs, SVOCs, and organotins by the same analytical methods utilized in the PEA.

The RI confirmed seven metals (antimony, arsenic, cadmium, copper, lead, mercury, and thallium), two PCBs (Aroclor-1248 and Aroclor-1254), and one PAH (benzo(a)pyrene [B(a)P]) exceeded regulatory screening criteria (2004 PRGs and 2005 CHHSLs) in soil. Higher concentrations of some metals listed above were detected in surface or shallow soil in a localized area along the western boundary, near the fire house. Elevated concentrations of lead and mercury appeared to be generally co-located, while elevated concentrations of arsenic and copper were detected at different locations. PCBs were detected in several surface and shallow soil locations extending across the Site. The highest concentrations were detected in soil in an unpaved area in the most southern portion of the Site. This area did not correspond to an area with elevated metal concentrations, although at least one location northeast of the former turntable (TtSPBW-15) contained elevated concentrations of PCBs and several metals, including copper, lead, and mercury. This same location had an elevated concentration of B(a)P in surface soil.

Seven metals (dissolved concentrations) were detected in Site groundwater at levels exceeding the water quality criteria (2005 COP and 2000 CTR, including the 6-month median and 30-day average criteria) including arsenic, beryllium, copper, mercury, nickel, thallium, and zinc. The maximum concentrations of the various metals were detected in wells located along the eastern and southern peripheries of the Site. In addition, by comparing the metal concentrations in soil with those observed in groundwater, only two of the maximum metal concentrations detected in groundwater (copper and mercury) appear to correspond to locations with elevated concentrations in soil.

Neither the VOCs nor the SVOCs detected in groundwater samples exceeded screening criteria. Five of the six detected VOCs and the one detected SVOC were observed in only one monitoring well, SPBW-GW5. The groundwater monitoring locations with the highest metal concentrations (filtered samples) do not appear to correspond with the detected organic constituents; only the maximum concentrations of arsenic and barium occurred in the same monitoring well, SPBW-GW5, where the VOCs and SVOC were detected.

#### 2.1.4 Background Metal Evaluation in the RI Addendum

In February 2009, the Harbor Department submitted a RI Addendum (Tetra Tech, 2009) to the DTSC presenting a determination of background threshold values (BTVs) for metals in soils and a comparison of the BTVs to concentrations measured at the Site. The BTV determinations were conducted in accordance with DTSC (2008) comments and are listed below:

**Background Threshold Values (BTV)**

<b>Metal</b>	<b>BTV (mg/kg)</b>
Aluminum	NA
Antimony	1.03
Arsenic	12.5
Barium	210.2
Beryllium	0.562
Cadmium	1.638
Chromium	35.86
Chromium, hexavalent	NA
Cobalt	8.414
Copper	51.5
Lead	13.25
Mercury	0.424
Molybdenum	7.355
Nickel	47.86
Selenium	4.88
Silver	0.43
Thallium	ND
Vanadium	42.04
Zinc	99.39

Notes: NA – not analyzed  
 ND – not detected  
 mg/kg = milligrams per kilogram

The BTVs were compared to metal concentrations measured in soil samples collected at the Site. Three soil borings (TtBCK-1 through TtBCK-3) were drilled offsite in the PEA to determine background soil conditions for metals; however, the samples collected at 0.5 feet and 2.5 feet contained elevated organic and metal concentrations and therefore these samples were not included in the metal background concentration determination. The maximum detected concentrations of all metals with calculated BTVs (as shown above) exceed background. Therefore, the results indicate surficial and shallow soil at the Site are impacted by metals.

An aluminum (Al) BTV could not be calculated because aluminum was not included in metal analyses of the sample data set. Additional sources were used to identify a potential background number for Al comparison. In the Kearny Foundation Special Report (Kearny, 1996), the average concentration of Al is 73,000 milligrams per kilogram (mg/kg), with a geometric mean of 71,000 mg/kg. In addition, an assessment of metals at 14 California Air Force Bases was conducted and results have been published (Hunter et al, 2005). Aluminum concentrations in soil samples from surface to 3 feet (2,718 samples) concentrations were calculated to be 23,400 mg/kg (95<sup>th</sup> percentile) and 32,100 mg/kg (99<sup>th</sup> percentile). Aluminum concentrations in soil samples from 3 to 15 feet (2,961 samples) were calculated to be 23,400 mg/kg (95<sup>th</sup> percentile) and 32,100 mg/kg (99<sup>th</sup> percentile). The authors of the Kearny Foundation Special Report concluded that the “95<sup>th</sup> percentile” is a good representation of background concentrations. The highest concentration of Al detected at the Site was 19,900 mg/kg, well below all study background values.

#### **2.1.5 2011 Seawater Sampling**

The Harbor Department conducted additional seawater sampling on May 26, 2011, which was submitted to DTSC in August 2011. Water samples were collected by AMEC staff on May 26, 2011 from four locations adjacent to the Site. Samples were collected from a 23-foot research vessel using a Van Dorn bottle. The collection bottle was lowered to a point within the riprap along the shoreline in close proximity to the bottom. The ends of Van Dorn bottle were sealed by sending a messenger weight down the line which triggered the closure system. The tidal cycle during the collection operation had just changed from high (at 18:23) to outgoing. The samples were analyzed for total and dissolved Title 22 metals and were compared to the California Toxics Rule (CTR) Criterion Continuous Concentration (CCC) and the Criterion Maximum Concentration (CMC). There are no CTR criteria for several of the metals tested. The analytical results showed that dissolved copper was slightly above the CCC (3.1 µg/L) at two locations: Stations 3 (4.53 µg/L) and 4 (4.56 µg/L). No other dissolved metals exceeded CTR criteria.

#### **2.1.6 2002, 2003, and 2007 Sediment Sampling**

To evaluate sediment chemistry concentrations in the vicinity of the Site, AMEC conducted multiple rounds of sediment collection and testing in 2002 and 2003 (AMEC, 2003). Samples were collected in an iterative approach, beginning immediately adjacent to the Site, then moving further offshore and up and down coast. Sediment samples were analyzed for metals, PCBs, PAHs, and organotins. The results from the studies described above were presented to the Los Angeles Contaminated Sediments Task Force (CSTF) Advisory Committee for evaluation. The Harbor Department and CSTF Advisory Committee identified copper as the primary contaminant of concern for the study area, and, after much deliberation, established a product recovery target of 254 mg/kg (dry weight) for copper (CSTF, 2003). This target was chosen largely because the same target had previously been identified for the IR Site 7 Navy Station site cleanup in the neighboring Port of Long Beach. The CSTF members unanimously acknowledged that this number was for site-specific use only, and was not to be considered as a cleanup standard at other sites without site-specific evaluation. A dredge prism was designed by (1) modeling the lateral extent of sediments exceeding the target recovery goal of 254 mg/kg copper and (2) extending the vertical limit of dredging down to the native Malaga Mudstone Formation. Sediments were dredged in summer 2003 in conjunction with the Port of Los Angeles

Main Channel Deepening Project and were disposed of at the Southwest Slip Confined Disposal Facility in the vicinity of Berths 106 through 117 in the inner harbor area of the Port.

In consultation with the CSTF Advisory Committee, the Port agreed to conduct a sediment removal verification study following completion of the dredging project. According to the final CSTF meeting record, the verification program was to involve a study “along the fringes of the dredged area within one year of completion of dredging” (CSTF 2003). To satisfy this requirement, AMEC prepared a Sampling and Analysis Plan (AMEC 2006) and conducted the verification study (AMEC 2007). The goal of this study was to verify that the dredging removed sediment with a concentration greater than 254 mg/kg (dry weight). Verification samples were collected on the outside fringe of the dredge footprint because sediments within the footprint itself were dredged down to the native Malaga Mudstone formation. The results shown include the sediment copper concentration as well as the copper concentrations in clam tissues (for Station C6 and the Reference Station). For the tissue endpoint, bent nose clams (*Macoma nasuta*) were exposed to test sediment in the lab during a 28-day exposure period. The copper levels in clam tissue exposed to test sediments were then compared to the copper levels in the reference sediment exposures to determine if the test clams had a statistically greater level of copper. This comparison indicated that there was no statistical difference between Station C6 clams and the clams exposed to reference sediment. The sites marked NS indicate that no bioaccumulation tests were conducted for this station.

As described above, the evaluation of the sediment is being conducted separately from the landside evaluation and remediation (as described in this RAW), which has been agreed upon by DTSC (DTSC, 2013).

### **2.1.7 2016 Additional Investigations for PCBs and Metals**

Additional PCB sampling was completed in January and April 2016 to further delineate PCB contamination in soil and concrete and identify PCB in building materials (paint and caulk).

Upon approval by the USEPA, 36 direct-push/hand auger borings and 11 concrete corings were completed. Sampling depths were 0.5, 2.5, 5.0, and 7 feet bgs to correspond with previous studies. PCB analysis of soil via EPA method 8082 indicated total PCB concentrations ranging from 37 J to 33,700 micrograms per kilogram ( $\mu\text{g/kg}$ ) in soils 2.5 feet bgs and shallower. Soil detections correlated both geographically and depth wise to the PEA (2006) and RI (2007). Three areas were identified to contain PCB soil concentrations above the unrestrictive Site soil cleanup goal of 220  $\mu\text{g/kg}$  (0.22 mg/kg). The first area is in the southernmost section of the Site along the perimeter of the electrical shop, the second area is south of the paint shop, and the third area is in the eastern area between the office/lockers and paint shop. The southern section of the property (first area) contained the highest detection of PCBs with 7 of 8 borings reporting PCB concentrations above the Site cleanup goal. Three concrete corings from the associated areas contained total PCB concentrations above the soil cleanup goal ranging between 240 to 4,430  $\mu\text{g/kg}$ . Soluble threshold limit concentration (STLC), total threshold limit concentration (TTLC), and Resource Conservation and Recovery Act (RCRA) hazardous waste concentrations were not exceeded by either individual Aroclor values or total PCB concentrations.

Results of the exterior paint sampling show that all buildings, with exception of the garage, have painted exterior surfaces containing PCBs. Detectable PCB concentrations in paint ranged from 150 J to 6,100  $\mu\text{g/kg}$ . Concentrations detected above the laboratory method detection limit (MDL), but below the laboratory reporting limit are estimated values noted with a “J”. One sample, Ti-SPBW-C4-S-0.5, was analyzed for TPH due to elevated PCB MDLs. As provided in Table 1, the sample contained 46,000 mg/kg of total TPH. Total PCB and individual Aroclor concentrations did not exceed STLC, TTLC, or RCRA hazardous waste criteria. Only the paint shop building contained caulk material. Total PCB concentrations from caulk samples ranged from 670 to 1,300  $\mu\text{g/kg}$ . A separate report describing the field sampling activities and results has been submitted to DTSC and USEPA (Tetra Tech, 2016).

Select soil samples were analyzed for individual metals based upon the FS (Tetra Tech, 2014) to confirm soil excavation limits. Fourteen soil samples from eight boring locations were submitted for individual metal analysis by EPA method 6010B for antimony, copper, lead, and zinc and by USEPA method 7471A for mercury. The analytical results are presented in Table 2.

The 2015 and 2016 soil metal and TPH data were incorporated into the Site data and the reasonable maximum exposure (RME) concentrations were recalculated and compared to the Site cleanup goals to identify areas for removal (the same process conducted in the FS). Three samples, Tt-SPBW-D8-0.5, Tt-SPBW-F6-0.5, and Tt-SPBW-E3-0.5, are consistent with elevated copper and lead concentrations of spent sand blast material detected in the PEA and will be removed as described in *Section 5*. In addition to the three sample locations, samples Tt-SPBW-C8-0.5 with elevated metals (copper and mercury) and Tt-SPBW-C4-S-0.5 with elevated TPH will be removed. The final areas for removal and RMEs are described in *Section 5*.

Additionally, based on the PCB concentrations detected in the concrete, the concrete pads associated with the soil removal areas will need to be demolished, removed, and disposed offsite. The concrete pads to be removed are described in *Section 5*.

## **2.2 NATURE AND EXTENT OF CONTAMINATION**

### **2.2.1 EXTENT OF CONTAMINATION IN SOIL**

Several investigations have been conducted by Tetra Tech and EnecoTech at the Site since 1994. Based on the soil data collected at the Site, metals (antimony, arsenic, copper, lead, mercury, and zinc), PCBs, benzo(a)pyrene (BaP), and total petroleum hydrocarbons (TPH) were identified to be the chemicals of potential concern (COPCs). The lateral and vertical extent of the metals, PCBs, and benzo(a)pyrene exceeding the cleanup goals (*Section 3.2*) show that the highest concentrations of most of these constituents occur in surface soils (0 to 3 feet bgs), with most concentrations decreasing with depth. A number of the higher concentrations of all of the metals listed above were detected in surface or shallow soils. Elevated concentrations of lead and mercury appeared to be generally co-located, while arsenic and copper were detected in different locations with elevated concentrations. The investigation analytical results including locations with concentrations exceeding the Site cleanup goals are provided in the Revised Feasibility Study, dated May 16, 2014. A hard copy has been provided to DTSC and it has been uploaded to the Envirostor Database by DTSC.

PCBs were detected in surface and shallow soils in a number of locations extending across the Site. The highest concentrations of PCBs were detected in soils in an unpaved area in the southern most section of the Site. Only one sample, SPBW-RI-S27-0.5, contained PCBs (Aroclor-1248) above 50 mg/kg, which is in the unpaved area in the southern most section.

### **2.2.2 EXTENT OF CONTAMINATION IN GROUNDWATER**

Analytical results from groundwater sampling in the PEA and RI indicate that the Site activities have had limited, if any, impact on groundwater. Remedial activities are not recommended for groundwater at the Site. Only TPH-diesel (at two locations) in groundwater exceeds the construction worker cleanup goal (data are provided in the Revised Feasibility Study, dated May 16, 2014, which was provided to DTSC in hard copy format and uploaded to the Envirostor Database by DTSC); however, it is unlikely that construction workers will be in direct contact with groundwater. The groundwater contains metals at concentrations that are within the same magnitude of applicable regulatory criteria. Excavation of the source of metals (i.e. in soil) will prevent future impacts from the Site to groundwater. Groundwater monitoring will be conducted after soil remediation to evaluate the effectiveness of the remedial action. Post-excavation groundwater sampling is described in *Section 5.7*.

## 2.3 HUMAN HEALTH AND SCREENING ECOLOGICAL RISK ASSESSMENT

A human health and ecological risk assessment (HHERA) was conducted to evaluate the potential health risks for future receptors at the Site. The evaluation was completed in accordance with the HHERA workplan prepared by Tetra Tech on behalf of the Harbor Department, which was approved by DTSC. The HHERA was prepared based on findings of the PEA (2006), RI (2007), and the RI Addendum (2009). The PEA and RI investigations have been conducted on a Site-wide basis and are considered representative of the current Site soil and groundwater conditions; thus, the data from the PEA and RI, as supported by appropriate quality assurance/quality control data, were used to characterize COPCs for the HHERA.

The HHERA is comprised of a human health risk assessment (HHRA) and a screening ecological risk assessment (SERA). The results of the HHERA are used as the basis of this FS and for calculating the 95 percent upper confidence limit (UCL 95%) on COCs for comparison to the goals. The Harbor Department conducted additional seawater sampling on May 26, 2011, which was submitted to the DTSC in August 2011.

### 2.3.1 HUMAN HEALTH RISK ASSESSMENT (HHRA)

The HHRA consists of four main components: 1) identification of chemicals of potential concern (COPCs), 2) identification of exposure pathway, 3) calculation of risk-based remedial goals, and 4) characterization of risk. Each of the components has been evaluated in accordance with DTSC and USEPA guidance.

COPCs are chemicals detected in the environment that may adversely affect human receptors. Historical and recent investigation results supported with appropriate quality assurance and quality control (QA/QC) data were used to identify COPCs for the HHRA. The investigation results from the PEA and RI as well as the background metal evaluation conducted in the RI Addendum provide the basis for HHRA. Accordingly, COPCs for the HHRA were identified for three environmental media at the Site, consisting of the following:

- Soil – 50 organic compounds (VOCs, PAHs, TPH, PCBs, SVOCs), four organotins, and 19 metals;
- Groundwater – 12 organic compounds (VOCs, PAHs, TPHs, and SVOCs), one organotin, and 18 metals; and
- Seawater – three metals.

The HHRA evaluated potential human contact with these COPCs in soil and groundwater as well as volatilization of chemicals from soils and groundwater to outdoor air.

Potential human exposure to the COPCs was examined by determining possible Site uses. Since the surrounding areas are used predominantly for commercial/industrial purposes, future uses of the Site are also likely to be commercial or industrial to be consistent with current zoning and Harbor Department operations. Therefore, the most likely receptors to be exposed to COPCs in soils at the Site are on-site commercial/industrial workers. The Harbor Department is a landlord for the state of California and under the Tideland Trust Act, the land is to be used for Port-related activities, not for residential usage. However, in order to evaluate unrestricted land use options including green space or parks (i.e., green space or parks can be a part of commercial development as a mitigation measure for said development), all exposure pathways and receptors were evaluated including residential receptors to provide a basis for consideration of unrestricted uses (i.e., no deed restriction or land use covenant). Furthermore, future Site usage will require demolition, remodeling of existing facilities, and/or construction of new facilities which may result in the exposure of construction workers to COPCs during construction activities. Thus, three groups of human receptors were evaluated in the HHRA: commercial/industrial workers, construction workers, and residents. In addition, to determine whether the Site may be a potential source of constituents that could

affect beneficial uses of surface water, the COPCs in seawater, groundwater, and soil were compared to water quality criteria (2009 COP and 2000 CTR). It should be noted that the 2009 COP criteria utilized are the same values as the 2005 COP.

The risks were estimated for the three groups of human receptors by comparing risk-based remedial goals to measured concentrations of COPCs in each environmental medium. Risk-based remedial goals were calculated using an assumed set of exposure parameters for each receptor group and chemical-specific toxicity values based on DTSC and USEPA guidance. Separate remedial goals and resulting risks were calculated for the carcinogenic and non-carcinogenic effects of each chemical. The ratios of the exposure concentrations and remedial goals were then summed to determine the multi-pathway carcinogenic risk estimate and non-carcinogenic hazard index (HI) for each receptor group.

Risk estimates can be compared to the target risk levels determined for each receptor group:  $1 \times 10^{-5}$  for commercial/industrial and construction workers and  $1 \times 10^{-6}$  for residential receptors. Both of the target risk levels fall within the USEPA (1990) risk management range of  $1 \times 10^{-6}$  to  $1 \times 10^{-4}$ . For non-carcinogenic effects, the USEPA (1989, 1990) considers an HI of less than one (1) protective of adverse health effects.

Future commercial/industrial workers were assumed to contact and incidentally ingest surface soil or a combination of surface and subsurface soils, inhale dusts emitted from soil, and inhale vapors emitted to outdoor air from soil. All of the risks estimated for commercial/industrial workers exceed the target risk of  $1 \times 10^{-5}$ . The risks estimated for soil exposure (either surface or subsurface soil) range from  $4 \times 10^{-5}$  to approximately  $7 \times 10^{-5}$ , primarily due to assumed exposure to carcinogenic PAHs and arsenic. Non-carcinogenic HIs calculated for future commercial/industrial worker exposures to soils (either surface or subsurface soil) exceeded the target HI of 1, primarily due to assumed exposure to antimony.

Future construction workers were assumed to contact and incidentally ingest surface and subsurface soils, inhale dusts emitted from soil, contact groundwater, and inhale vapors emitted from both soil and groundwater. The resulting risk estimated for exposure to only surface soils (no dermal or inhalation exposure to groundwater) is  $1 \times 10^{-5}$ , which is equal to the target risk level and is primarily due to assumed exposure to carcinogenic PAHs and arsenic. The resulting risks for exposure to soil (0 to 10 feet bgs) and groundwater were estimated to be approximately  $7 \times 10^{-6}$ , which is below the target risk level of  $1 \times 10^{-5}$ . Non-carcinogenic HIs calculated for future construction worker exposure to soils and groundwater (range from 11 to 40) exceeded the target HI of 1, primarily due to exposure to TPH-diesel in groundwater and antimony in soil.

Risks were evaluated for future on-site residents in order for the Harbor Department management to assess potential health concerns associated with unrestricted Site use. For this evaluation, residents were assumed to be comprised of both children and adults who may contact and incidentally ingest surface soil or a combination of surface and subsurface soils, inhale dusts emitted from soil, and inhale vapors emitted to outdoor air from soil. The risk estimated for future on-site residents exceeds the target risk of  $1 \times 10^{-6}$ . The risks estimated for exposure to subsurface soils is  $1 \times 10^{-4}$ , primarily due to assumed exposure to arsenic, Aroclor-1248, and carcinogenic PAHs with contributions from Aroclor-1260 and Aroclor-1254. The non-carcinogenic HI calculated for future on-site resident exposures to surface and subsurface soils (HI = 31) exceeds the target HI of 1, primarily due to assumed exposure to antimony and arsenic with contributions from mercury, copper, TPH-motor oil, cobalt, Aroclor-1254, and TPH-gasoline.

As described above, arsenic, carcinogenic PAHs, Aroclor-1248, antimony, and TPH-diesel are the primary contributors to the estimated risks and hazards from potential exposures to soil or groundwater for the potential receptors evaluated in this report. It is notable that the estimated risks for these chemicals are driven primarily by a limited number of sampling locations associated with elevated concentrations (i.e., greater than background levels and or population-specific goals). The vast majority of these sampling



locations are located within the southern half of the Site. Additionally, most of the samples with elevated concentrations in soil are located within the top 2.5 feet of soil.

For exposures to lead in soil, two sets of remedial goals were used to evaluate potential lead exposures at the Site as recommended by DTSC (DTSC, 2010). One goal protective of adults, including pregnant women, is based on the commercial/industrial CHHSL of 320 mg/kg (CalEPA 2009) and another goal protective of children is based on the residential CHHSL of 80 mg/kg (CalEPA 2009). The remedial goals protective of future workers and on-site residents are exceeded by the UCL 95% lead concentrations calculated for surface and subsurface soils. Notably, lead concentrations exceeding the worker and residential remedial goals were detected in a limited number of primarily shallow soil samples (14 samples exceed the construction worker goal and 29 samples exceed the residential goal). The five highest concentrations, ranging from 1,850 to 88,900 mg/kg are located throughout the central portion of the Site from the Fire House building located at the western Site boundary to the paint shop/paint storage area located to the east. The sample locations containing the five highest lead concentrations are TtSPBW-24, TtSPBW-35, TtSPBW-53, SPBW-RI-S7, and SPBW-RI-S16.

To determine whether the Site may be a potential source of constituents that affect beneficial uses of seawater, COPC concentrations in seawater and groundwater were compared to criteria protective of human receptors. None of the three COPCs detected in 2006 seawater samples (chromium, vanadium, and zinc) collected in the harbor near the Site exceed their corresponding criteria. Only one COPC in groundwater (arsenic) exceeds the corresponding chemical-specific water quality criteria.

Finally, the COPCs in soil were evaluated to determine whether any could leach to groundwater at levels of potential concern, since the groundwater is tidally influenced and in connection with the adjacent harbor waters. This evaluation consisted of the comparison of COPC concentrations in soil with calculated goals set to be in equilibrium with 10 times the chemical-specific water quality criteria, per request of DTSC. This resulted in 10 COPCs in soil with concentrations exceeding their calculated goals based on consumption of fish, including three metals, three aroclors, and four butyltins.

It should be noted that the equilibrium calculations are highly protective because the goals are based on the assumption that there is no degradation of COPCs in the vadose zone or groundwater and limited (10 times) dilution of COPCs during groundwater transport in groundwater and subsequent mixing with seawater. Consequently, assuming that additional mixing is likely to occur during discharge to the channel/harbor, only seven compounds (dibutyltin, monobutyltin, tributyltin, Aroclor-1248, Aroclor-1254, Aroclor-1260, and mercury) exceed their respective goals based on human consumption of fish by at least one or two orders of magnitude. Thus, these compounds may be the primary COPCs in soil that may leach at levels of potential health concern for the adjacent harbor waters. Copper and lead were also present in soil at concentrations that exceeded their calculated goals; however, the goals for these two metals were calculated based on drinking water maximum contaminant levels (MCLs) rather than consumption of fish because there are no other water quality criteria. This is highly protective since groundwater at the Site is not currently used nor will be used for drinking water as it is southward of the LACDPW Dominguez Gap seawater injection barrier, and in the area de-designated for drinking water usage by the LARWQCB, and exceeds the LARWQCB drinking water criteria for total dissolved solids. As noted in DTSC's comments (DTSC, 2011), leaching goals based upon groundwater criteria protective of potable use is not warranted since the groundwater at the Site is not "currently used for potable use nor is it ever likely to be so used due to high salinity. (DTSC, 2011).

### **2.3.2 SCREENING ECOLOGICAL RISK ASSESSMENT (SERA)**

A SERA was conducted to evaluate ecological hazards at the Site. Chemicals of potential ecological concern (COPECs) potentially related to past Site operations were identified in environmental media (i.e., seawater, groundwater, and soil) that may be accessible to biota of concern, the ecological receptors. Two

potentially affected areas at the Site were considered. The first area, the upland (terrestrial area) of the Site, contains negligible habitat and was therefore determined to have no potentially complete exposure pathways, thus posing no hazards to receptors of concern. The second potentially affected area is composed of the West Channel and Outer Harbor waters adjacent to the Site. Receptors of concern identified as potentially present were marine biota in the water column (e.g., plankton, fish) or attached to hard substrata (e.g., algae, barnacles); infaunal and epifaunal invertebrates in soft-bottom sediments (i.e., sediment-dwelling organisms); piscivorous birds, the California sea lion, and the harbor seal. Exposure routes considered potentially complete were: (1) direct exposure to constituents in seawater by marine biota and (2) ingestion of constituents in food items by piscivorous birds and marine mammals.

A screening risk evaluation was conducted to identify potential hazards to marine biota in seawater, including potential groundwater and soil sources, to provide a general understanding of landside constituents that may need to be further considered. Since birds and marine mammals are likely to spend a minor portion of their time in the vicinity of the Site, exposures to Site-related constituents are likely to be minor.

The screening evaluation of seawater COPECs indicates that zinc occurred at a concentration four times higher than the seawater goal based on a protective water quality criterion. Although this suggests a potential for impacts to marine biota, there is uncertainty in the attribution of zinc seawater concentrations to Site-related sources due to the presence of multiple release sources in the harbor area.

The screening evaluation of groundwater COPECs that may migrate into seawater indicates that concentrations of one COPEC, copper, slightly exceeds its protective groundwater goal. This exceedence is unlikely to represent a hazard to marine biota in the adjacent channel and harbor due to the low magnitude of the screening ratio and likely significant dilution of any groundwater constituents that may migrate into the seawater.

The screening evaluation of soil COPECs that may leach into groundwater and migrate to seawater indicates that four metals (i.e., copper, lead, mercury, and zinc) exceed their respective soil leaching goals by more than a factor of 10. However, these exceedences are not considered to indicate significant hazards to marine biota due to the likely significant dilution of COPECs by groundwater and seawater entering the harbor. The screening evaluation primarily indicated that concentrations of one COPEC, tributyltin, may leach at levels of concern to marine biota in the adjacent channel and harbor.

Based upon the HHRA analysis of the PEA and RI metals data, copper and zinc were identified in the groundwater and surface water, respectively, exceeding criteria potentially protective of marine biota. Six metals (antimony, arsenic, copper, lead, mercury, and zinc) were detected in the groundwater and determined to be statistically elevated over background in the soil.

Organotins (monobutyltin and tributyltin equivalents) were determined to be statistically elevated in soil and reported concentrations exceeding potential leaching goals presented in the HHRA (refer to Table 5-7 of the HHRA and in Appendix B of the Revised FS). However, upon later evaluation it was noted that the reporting limits for groundwater samples were 3.0 nanograms per liter, ng/L, (0.003 µg/L) in the 2006 PEA and from 0.43 to 0.97 ng/L (0.00043 to 0.00097 µg/L) in the 2008 RI, which are below the criterion protective of marine biota (7.4 ng/L, 0.0074 µg/L). Therefore, based on these findings and the hierarchy indicated above, it has been determined that organotins are no longer considered a COC with regard to remediation of soil at the Site.

## SECTION 3

# REMOVAL ACTION GOALS AND OBJECTIVES

### 3.1 REMEDIAL ACTION OBJECTIVES

RAOs required under the National Contingency Plan (NCP) consist of medium- or probable unit- specific goals for protecting human health and the environment. The RAOs should specify:

- The contaminant and media of concern
- Exposure routes and receptors
- An acceptable range or range of levels for each exposure route (i.e., remediation goal).

The RAO for unrestricted (residential) land use is:

1. Prevent human exposures (industrial/commercial, construction workers, and residents) by ingestion, dermal contact, or inhalation of the COCs in soil (i.e. antimony, arsenic, copper, lead, mercury, zinc, B[a]P-equivalents, total PCBs, and TPH-gasoline, TPH-diesel, and TPH-motor oil) at levels higher than the cleanup goals protective of industrial/commercial workers at a target cancer risk of  $1 \times 10^{-5}$  and a HI of 1 and protective of residents at a target cancer risk of  $1 \times 10^{-6}$  and a HI of 1.
2. Mitigate potential impacts to marine biota from leaching of arsenic, copper, lead, and zinc in soil by removing areas with elevated concentrations (but not below the background soil metal goals).
3. Mitigate potential impacts to marine biota by removing metals in contact with groundwater that were detected in groundwater and channel water at elevated concentrations (copper and zinc).

### 3.2 SITE CLEANUP GOALS DERIVATION

Utilizing the RAO, the Site cleanup goals were derived and described in detail in the FS. As noted there are no goals for groundwater. Since the FS was prepared, the cleanup goals have been revised by the Harbor Department for arsenic, lead, mercury, TPH-gasoline, and TPH-diesel to be consistent with similar sites at the Port undergoing remediation. The new goals are more conservative (lower values). Table 3 provides a comparison of the original FS cleanup goals and the final Site cleanup goals for unrestricted Site use along with the basis of the final cleanup goal. Additionally, samples with the following COC concentrations will be removed:

- PCB concentrations greater than 1.1 mg/kg
- Arsenic concentrations greater than 25 mg/kg (2 times BTV)
- Lead concentrations greater than 160 mg/kg (2 times the USEPA Region IX 2016 residential screening level, RSL)
- Mercury concentrations greater than 46 mg/kg (2 times the USEPA Region IX RSL)

### 3.3 SOIL REMOVAL AREA CALCULATION

The FS described the process by which statistical analyses were utilized to identify reasonable maximum exposure (RME) concentrations based on the sample values remaining in place. In order to identify areas to be removed, the UCL 95% concentrations (known as the RME value) were calculated based upon the data set of concentrations of COCs left-in-place.

The UCL 95% concentrations are calculated using the latest version of ProUCL from USEPA (2009a, b), ProUCL version 4.0 (v4.0.04). In addition to calculating UCL 95% for data that are normally and lognormally distributed, ProUCL v4.0 calculates UCL 95% data that follow other parametric distributions (i.e., the gamma distribution) and incorporates nonparametric estimation methods (e.g., Skewness adjusted CLT, Kaplan-Meier, and bootstrapping methods). Some of the methods used by ProUCL v4.0, such as the Kaplan-Meier (KM) method and the robust regression on order statistics (ROS) methods, incorporate methods for calculating UCL 95% with non-detected concentrations (i.e., below laboratory reporting limits). For this Site, when sufficient samples were available to calculate the 95% UCL concentrations, the results were lower than the maximum measured concentrations. Correspondingly, the maximum concentrations were used as the recommended UCL only when an insufficient number of samples or an insufficient number of detected concentrations were available to calculate a UCL 95% concentration.

The selection of samples to simulate removals was selected based upon high metals concentrations (e.g., copper and arsenic). Most of the locations with high arsenic and/or copper are collocated with high concentrations of other COCs based on the data summarized in the Revised Feasibility Study, dated May 16, 2014. New UCL 95% calculations were conducted after repeating the removal process iterations until the reasonable maximum exposures (RMEs) from samples left-in-place were below the selected cleanup goals. The removals simulations were considered complete after the removal scenarios were evaluated and the RMEs were equal to or less than the cleanup goals. Table 4 provides the list of boring locations and the estimated volume of soil to be removed to meet the cleanup goals.

The additional soil PCB, metal, and TPH analytical results from the 2015 and 2016 soil investigation were incorporated into the data set and new removal simulations were conducted until the UCL 95% were below the Site cleanup goals. PCB hot-spots, soil with total PCBs exceeding 1.1 mg/kg, are to be removed and have been included in the removal simulations. Table 5 presents the revised RME and the RAW cleanup goals as well as minimum concentration and maximum concentrations left-in-place.

### **3.4 CUMULATIVE RISK ESTIMATES**

#### **Post Remediation Risk Estimates**

Post-remediation risk estimates are summarized below for each of the populations evaluated in the HHERA (Tetra Tech, 2011). These populations include commercial/industrial workers, construction workers, and potential future residents. Although residential use of the Site is not permissible under the Tidelands Trust Act as previously described, it was included in the HHERA to evaluate the potential for unrestricted land use.

#### **Chemicals of Concern**

The chemicals of concern (COCs) in soil were identified based on the results of the HHERA and include antimony, arsenic, copper, lead, mercury, zinc, carcinogenic polycyclic aromatic hydrocarbons (expressed as benzo(a)pyrene equivalents), polychlorinated biphenyls (PCBs), TPH-gasoline, TPH-diesel, and TPH-motor oil.

#### **Risk-Based Screening Levels**

Potential post-remediation risks and hazards are estimated using soil risk-based screening levels (RBSLs) that are considered protective of the potentially exposed populations associated with the Site. The RBSLs were developed as part of the 2011 HHERA using recommended target risk and hazard levels. USEPA's 1990 guidance (USEPA, 1990) indicates that a carcinogenic risk probability between 1 in 1,000,000 and 1 in 10,000 ( $1 \times 10^{-6}$  to  $1 \times 10^{-4}$ ) are generally acceptable. The lower end of the target risk range is typically applied to residential scenarios, whereas the higher range is typically considered appropriate for

commercial/industrial situations. As described in the HHERA, the cancer RBSLs were developed based on a target risk  $1 \times 10^{-6}$  for residents and a target risk of  $1 \times 10^{-5}$  for commercial workers and construction workers. For potential non-carcinogenic effects, USEPA (1990) indicates that non-carcinogenic chemicals should not be present at levels expected to cause adverse health effects. Therefore, for this evaluation, potential hazards for all potential receptors have been evaluated based on a target hazard index (HI) of 1. Individual chemical exposures that yield HIs of less than 1 are not expected to result in adverse non-cancer health effects (USEPA, 1989).

### **Post-Remediation Risk Characterization**

This section presents the results of the post-remediation risk evaluation for soil at the Site. As was conducted in the 2011 HHERA, potential risks to worker populations were evaluated using representative soil concentrations from the 0 to 2 foot depth interval and the 0 to 10 foot depth interval. For the residential scenario, the 0 to 10 foot depth interval was evaluated in the HHERA as per risk assessment guidelines. Thus, for the post-remediation risk evaluation, potential risks have been evaluated based on representative concentrations for the same receptor-specific depth intervals evaluated in the 2011 HHERA.

As described in more detail below, the levels of arsenic and B(a)P-equivalents remaining at the site are primarily attributable to ambient conditions at the Site. For this reason, the post-remediation risk estimates provided below include total risks, risks attributable to background, and estimated site-related risks, which do not include risk or hazard attributable to background.

#### *Estimated Risk and Hazard Attributable to Ambient Conditions*

In regard to the results of the post-remediation risk characterization, it is noteworthy that the primary contributors to the estimated risk and hazard are likely primarily attributable to ambient conditions at the site. Both the arsenic RME concentrations and B(a)P-equivalent RME concentrations are within the range of ambient background levels. As indicated in Table 6-1 through 6-5, the arsenic RME in soil from 0-2 feet is 11 mg/kg and the RME in soil from 0-10 feet is 10.7 mg/kg, which are below the background threshold value of 12 identified in the 2011 HHERA. Similarly, the B(a)P-equivalent RME concentrations for the 0 to 2 foot depth interval (0.044 mg/kg) and the 0 to 10 foot depth interval (0.066 mg/kg) are well below the 95% upper confidence level (95%UCL) on the arithmetic mean for ambient B(a)P-equivalent levels in southern California soils (0.24 mg/kg) (DTSC 2009).

#### *Commercial/Industrial Workers (0-2 feet)*

As shown in Table 6-1, the total estimated cumulative post-remediation cancer risk for commercial/industrial workers potentially exposed to soils from 0 to 2 feet bgs is  $8 \times 10^{-6}$ , which is within the low end of the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$  and below the target risk level for workers ( $1 \times 10^{-5}$ ). The estimated non-carcinogenic HI is 0.1, which is well below the target HI of 1.

Assuming that the arsenic and B(a)P-equivalent levels are primarily attributable to ambient conditions, the resulting site-related incremental lifetime cancer risk for commercial/industrial workers would be  $4 \times 10^{-7}$ , which is below the USEPA target risk range and below the target risk level for workers ( $1 \times 10^{-5}$ ). Similarly, the site-related estimated non-carcinogenic HI would be 0.08, which is well below the target HI of 1.

#### *Commercial/Industrial Workers (0-10 feet)*

As shown in Table 6-2, the total estimated cumulative post-remediation cancer risk for commercial/industrial workers potentially exposed to soils from 0 to 10 feet bgs is  $8 \times 10^{-6}$ , which is within the low end of the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$  and below the target risk level for

commercial/industrial workers ( $1 \times 10^{-5}$ ). The estimated non-carcinogenic HI is 0.09, which is well below the target HI of 1.

Assuming that the arsenic and B(a)P-equivalent levels are primarily attributable to ambient conditions, the resulting site-related incremental lifetime cancer risk for commercial/industrial workers would be  $3 \times 10^{-7}$ , which is below the USEPA target risk range and below the target risk level for commercial/industrial workers ( $1 \times 10^{-5}$ ). Similarly, the site-related estimated non-carcinogenic HI would be 0.05, which is well below the target HI of 1.

#### *Construction Workers (0-2 feet)*

As shown in Table 6-3, the total estimated cumulative post-remediation cancer risk for construction workers potentially exposed to soils from 0 to 2 feet bgs is  $1 \times 10^{-6}$ , which is at the low end of the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$  and well below the target risk level for construction workers ( $1 \times 10^{-5}$ ). The estimated non-carcinogenic HI is 0.6, which is well below the target HI of 1.

Assuming that the arsenic and B(a)P-equivalent levels are primarily attributable to ambient conditions, the resulting site-related incremental lifetime cancer risk for commercial/industrial workers would be  $6 \times 10^{-8}$ , which is below the USEPA target risk range and below the target risk level for construction workers ( $1 \times 10^{-5}$ ). Similarly, the site-related estimated non-carcinogenic HI would be 0.3, which is well below the target HI of 1.

#### *Construction Workers (0-10 feet)*

As shown in Table 6-4, the total estimated cumulative post-remediation cancer risk for construction workers potentially exposed to soils from 0 to 2 feet bgs is  $1 \times 10^{-6}$ , which is at the low end of the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$  and well below the target risk level for construction workers ( $1 \times 10^{-5}$ ). The estimated non-carcinogenic HI is 0.5, which is below the target HI of 1.

Assuming that the arsenic and B(a)P-equivalent levels are primarily attributable to ambient conditions, the resulting site-related incremental lifetime cancer risk for commercial/industrial workers would be  $4 \times 10^{-8}$ , which is below the USEPA target risk range and below the target risk level for construction workers ( $1 \times 10^{-5}$ ). Similarly, the site-related estimated non-carcinogenic HI would be 0.2, which is well below the target HI of 1.

#### *Future Residents (0-10 feet)*

As shown in Table 6-5, the total estimated cumulative post-remediation cancer risk for future residents potentially exposed to soils from 0 to 10 feet bgs is  $3 \times 10^{-5}$ , which is near the mid-point of the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$  and exceeds the target risk level for future residents ( $1 \times 10^{-6}$ ). The estimated non-carcinogenic HI is 0.9, which is less than the target HI of 1.

For the residential scenario, the primary contributors to the estimated risk are arsenic and B(a)P-equivalents (i.e., carcinogenic PAHs). Arsenic represents 92% of the estimated risk and B(a)P-equivalents represent 6% of the estimated risk.

Assuming that the arsenic and B(a)P-equivalent levels are primarily attributable to ambient conditions, the resulting site-related incremental lifetime cancer risk for future residents would be  $7 \times 10^{-7}$ , which is below the USEPA target risk range and below the target risk level for residents ( $1 \times 10^{-6}$ ). Similarly, the site-related estimated non-carcinogenic HI would be 0.4, which is well below the target HI of 1.

### **3.5 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS**

Applicable or Relevant and Appropriate Requirements (ARARs) are federal and state environmental statutes, regulations, and standards. Applicable requirements are federal or state laws or regulations that specifically address a hazardous substance, pollutant, contaminant, removal action, or location. Relevant and appropriate requirements that, while not “applicable,” address problems or situations sufficiently similar to those encountered that their use is well suited to the particular site. State requirements are ARARs only if they are more stringent than federal requirements.

In addition to ARARs, this analysis includes an evaluation of To-Be-Considered criteria (“TBCs”). TBCs are advisories, criteria, or guidance that may be considered for a particular action or specific issue, as appropriate. TBCs are not ARARs because they are neither promulgated nor enforceable.

The ARARs or TBCs may be: 1) chemical; 2) location; or 3) activity specific. Chemical specific ARARs or TBCs are usually health- or risk-based numerical values or methodologies used to determine acceptable concentrations of chemicals that may be found in, or discharged to, the environment. Location-specific ARARs or TBCs restrict actions or contaminant concentrations in certain environmentally sensitive areas. The ARARs identified for the Site are summarized in Table 7.

## SECTION 4

### ALTERNATIVE EVALUATION

As described in *Section 3.0*, antimony, arsenic, copper, lead, mercury, zinc, B(a)P-equivalents, PCBs, and TPH in soil (0 to 10 feet) have been determined to require remediation at the Site to achieve the cleanup goals for unrestricted land use. The following sections provide the evaluation of remedial alternatives as presented in the 2014 Revised FS.

#### 4.1 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

Five general response actions alternatives were developed and evaluated to achieve the RAOs described in *Section 3*. These alternatives were developed based on proven remedial technologies and site-specific conditions for the treatment of the contaminated soil. The five general response action alternatives include no action, containment (capping), ex-situ soil washing, chemical treatment (in-situ or ex-situ), and excavation and offsite disposal.

##### 4.1.1 ALTERNATIVE 1: NO ACTION

The no action alternative serves as a baseline for the Site. In this scenario, no action will be performed to contain or treat the soil area containing the COCs. This option would not eliminate the contamination and the soil would serve as a potential source of human health and ecological risks. Since no remedial action would be implemented, the long-term human health and environmental risks for the Site would remain the same as those identified in the HHERA. No action does not address the RAOs and would not meet regulatory agency approval. Therefore, a no action alternative was not selected for further evaluation.

##### 4.1.2 ALTERNATIVE 2: CONTAINMENT - CAPPING

Alternative 2 includes containment of the contaminated soil by installation of a cap to prevent exposure to residential and commercial/industrial receptors and additional migration of contaminants (via airborne dust) to the adjacent channel/harbor water. A variety of capping options are available and include installation of compact clay with soil, asphalt, concrete, or multimedia caps (such as clay and synthetic membrane covered by clean soil and asphalt/concrete) over the areas of contamination.

Although installation of a cap would minimize exposure via inhalation, dermal contact, or ingestion to residential and commercial/industrial receptors, and prevent surface water infiltration, a cap will not mitigate leaching of soil contaminants into groundwater, which is in contact with the adjacent channel/harbor, since contaminated soil would remain in-place and the Site is tidally influenced. Furthermore, since the contaminated soil would remain in-place, future construction workers would be exposed to these contaminants during any subsurface construction work, including trenching for utilities or excavation for building foundations. Any excavated soil from construction activities would require sampling and if impacted, would require waste management and offsite disposal.

Under Alternative 2, containments would impose restrictions on future land use (deed restriction) which would not meet the Harbor Department's plan for the site to be designated as unrestricted land use. Furthermore, Alternative 2 requires operation and maintenance of the cap in perpetuity, requires additional health and safety requirements (i.e. 40-hour hazardous waste and emergency response (HAZWOPER) training per Title 29 of the Code of Federal Regulations, Part 1910, 29 CFR 1910) for all workers who may contact contaminated soil or groundwater, and would not prevent leaching of contaminated soil to groundwater, which may impact marine biota. Therefore, Alternative 2 does not satisfy the RAOs and was not further evaluated.



#### **4.1.3 ALTERNATIVE 3: EX-SITU SOIL WASHING**

Alternative 3 consists of excavating the soil, washing the soil to remove contaminants, and reusing the soil as backfill onsite. During soil washing, contaminants sorbed onto fine soil particles are separated from bulk soil in a water-based system on the basis of particle size. The wash water may be augmented with a basic leaching agent, surfactant, or chelating agent or by adjustment of pH to help remove organics and heavy metals. Soils and wash water are mixed ex situ in a tank or other treatment unit. The wash water and various soil fractions are usually separated using gravity settling. Complex mixture of contaminants in the soil (such as a mixture of metals, SVOCs, and PAHs) and heterogeneous contaminant compositions throughout the soil mixture make it difficult to formulate a single suitable washing solution that will consistently and reliably remove all of the different types of contaminants and sequential washing, using different wash formulations and/or different soil to wash fluid ratios, will most likely be required. Soil washing however has not been proven to successfully remove PCBs and therefore would not remove all COCs and would preclude the use of washed soil as backfill. Alternative 3 does not satisfy the RAOs and was not considered for further evaluation.

#### **4.1.4 ALTERNATIVE 4: EX-SITU OR IN-SITU CHEMICAL TREATMENT**

Alternative 4 consists of excavating the impacted soil above the COCs, treating onsite, and reusing the soil as clean backfill or injecting a chemical within the soil (in-situ) at locations requiring remedial action. However, the treatability bench-scale study conducted in 2010 did not produce an observable significant reduction of PCBs in any of the chemically treated samples. There are no known chemicals capable of reducing concentrations of PCBs or metals in soil, which are the two primary COCs for remedial action.

Furthermore, in-situ treatment options are difficult to implement at the Site because the Site is tidally influenced and located immediately adjacent to channel water. Any treatment option must not impact the channel and be in accordance with the Water Quality Control Plan: Los Angeles Region Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties (LARWQCB, 1994). In conclusion, no known effective chemical treatments are available and therefore Alternative 4 was not considered for further evaluation.

#### **4.1.5 ALTERNATIVE 5: EXCAVATION AND OFFSITE DISPOSAL**

Alternative 5 consists of excavating the contaminated soil to achieve site-wide compliance with the selected cleanup/leaching goals, transporting the material for offsite treatment and disposal, and replacing the excavated soil with clean backfill. Simulated removals (i.e., “removal” of COC concentrations from selected sample locations) were conducted to meet the selected cleanup goals. In the FS, the simulation demonstrated that the cleanup goals can be achieved by excavation and offsite disposal. The simulation calculated new RME concentrations (i.e., the lower of the maximum concentration detected or the UCL 95% on the mean concentration) based on the simulated removals for each COC.

The soil would be excavated, containerized, analyzed, and transported offsite for either treatment and/or disposal at a permitted treatment, storage, disposal facility (TSDF) based on excavation soil waste characterization/designation. Based upon the groundwater depths encountered during the PEA and RI investigations, groundwater is not expected to be encountered in most of the excavations during remediation. Excavations adjacent to the seawall with riprap behind it (southern and western Site boundaries) will be conducted during low tide to prevent seepage of groundwater/seawater from entering the excavations. Excavation can be implemented with conventional earth-moving equipment (e.g. a backhoe and/or an excavator).

## 4.2 EVALUATION CRITERIA

The review of available technologies and implementability of the alternatives described in *Section 4.1* determined Alternative 5 to be the most viable option to achieve the RAOs. For this reason an engineering evaluation/cost analysis was not necessary and thus not performed.

Nine basic evaluation criteria set forth by the NCP, Part 300.430 will be used for the comparative analysis on the selected remedial alternative. The nine criteria include the following:

- Overall Protection of Human Health and the Environment;
- Compliance with ARARs;
- Long-Term Effectiveness and Permanence;
- Reduction of Mobility, Toxicity, or Volume through Treatment;
- Short-Term Effectiveness;
- Implementability;
- Cost;
- State Acceptance; and
- Community Acceptance.

The first two criteria are considered “threshold criteria” that all alternatives must achieve. The next five are “primary balancing criteria” that serve to ensure that decision-makers are informed of the uncertainties and significant aspects associated with each alternative. The remaining two criteria are “modifying criteria” that require state and community input and acceptance of the preferred alternative.

## 4.3 SOIL ALTERNATIVE 5: EXCAVATION AND OFFSITE DISPOSAL

As described in *Section 4.1.5*, Alternative 5 consists of the excavation and transportation of contaminated soil to an appropriate landfill or treatment facility for treatment and disposal. Selection of excavation areas were based upon simulated removal scenarios (i.e., “removal” of COC concentrations from selected sample locations) to achieve Site compliance with the selected cleanup goals by calculating new RME concentrations (i.e., the lower of the maximum concentration detected or the UCL 95% on the mean concentration). All of the excavations will be backfilled and compacted to 90% compaction (or otherwise designated by the Harbor Department) with clean excavated soil and/or clean imported fill. All soil used as backfill will meet the Site-Specific Import Fill Criteria (Appendix B).

### 4.3.1 OVERALL PROTECTION OF HUMAN HEALTH AND MARINE BIOTA

The primary risk to humans and the environment is posed through ingestion, direct dermal contact, and inhalation routes. The primary risk to marine biota is from leaching of soil to groundwater with migration to channel water due to the tidal influence on the Site. By removing high concentration areas (i.e. PCB hot-spots) and calculating new RMEs from the simulated removals, site-wide compliance with the cleanup goal respective to each RAO is demonstrated.

### 4.3.2 COMPLIANCE WITH ARARS

Alternative 5 can be implemented within the ARARs for the Site. ARARs from state, federal, and local regulatory agencies will be applied during remediation activities. These include 1) PCB regulations and waste designation (40 CFR 760); 2) South Coast Air Quality Management District (SCAQMD) nuisance dust rules; 3) construction National Pollutant Discharge Elimination System permits from the State Water

Resources Control Board (SWRCB); 3) City of Los Angeles excavation permit, and 4) Harbor Department's Site Specific Import Fill Criteria. A worker health and safety program will be developed and implemented to comply with federal and California Occupational Safety and Health Administration (Cal-OSHA) regulations.

#### **4.3.3 LONG-TERM EFFECTIVENESS AND PERMANENCE**

Alternative 5 effectively mitigates all three receptor groups: residential, commercial/industrial, and construction workers, to the exposure pathways and provides source removal which will greatly reduce the potential for metals to leach into groundwater and impact channel/harbor water (protective of marine biota). The excavations will be backfilled with certified clean fill material that meets the Site Specific Import Fill Criteria and long-term maintenance would not be required since the contaminants will be eliminated and the site-wide RMEs are within compliance for unrestricted Site use.

#### **4.3.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME**

Alternative 5 will reduce the affected media (soil) of the COCs (i.e. metals, PCBs, PAHs, and TPH). The proposed excavation volume and area to achieve unrestricted land use is approximately 1,146.5 tons (674.4 cubic yards) spanning a total surface area of approximately 4,611 square feet. Excavations range from 3.1 tons (1.9 cubic yards, 25 square feet) to 210 tons (124 cubic yards, 835 square feet) and consist of mainly nine larger excavation (combining more than one sample location) ranging from 40 square feet to 835 square feet, 39 locations which are approximately 25 square feet (5 feet by 5 feet), and two locations smaller than 25 square feet located between/behind existing buildings. The largest excavation areas to achieve unrestricted land use is located in the turntable, northwest of the former paint shop building, and in the southern PCB-impacted area of the Site. A maximum of 60 boring locations will be remediated and when the RMEs (UCL 95%) were recalculated, PCBs, PAHs, and TPH were reduced to RME values by one order of magnitude or lower than the Site cleanup goals and risks (both carcinogenic and non-carcinogenic) were calculated to be below acceptable levels (*Section 3.4*). All metals will be reduced to RME values lower than the Site cleanup goal, which reduces Site toxicity. In addition to source removal, backfilling with clean imported soil will create a barrier between the channel water and Site groundwater, especially in locations directly adjacent to the West Channel. Figures 4 through 9 present the locations requiring remediation to achieve site-wide compliance with the selected cleanup goals.

The proposed excavation volumes under this RAW are presented in Table 4.

#### **4.3.5 SHORT-TERM EFFECTIVENESS**

Exposure to COCs and fugitive dust may occur during remedial activities. Primary routes of exposure include inhalation, ingestion, and dermal contact. Air and worker exposure monitoring will be performed during remedial activities including monitoring of dust, VOCs, and noise to ensure adherence with appropriate regulatory permits (i.e., SCAQMD and Cal-OSHA) and determine when mitigation measures (i.e., engineering controls) will be necessary.

#### **4.3.6 IMPLEMENTABILITY**

As previously determined, this alternative can be implemented with relative ease. Excavation of the contaminated soil and concrete, offsite transportation to disposal and/or treatment facilities, and backfill of clean import fill material can be performed with conventional earth-moving and construction equipment.

#### **4.3.7 COST**

The estimated remediation cost for Alternative 5 to the cleanup goals is \$980,751 as shown in Table 8. This estimate includes pre-excavation demolition of Site features within the excavation areas including removal and recycling of non-contaminated concrete/asphalt, turntable, and steel rails, followed by excavation and offsite treatment/disposal of the contaminated soil, confirmation sampling, import of clean fill, backfilling of all excavations to 90% compaction, field oversight, statistical analyses, and reporting. The costs include excavation and offsite treatment/disposal costs for the three areas located adjacent to and inside of existing buildings that will be remediated once the buildings have been demolished. Costs assume that no additional removals will be necessary upon completion of the proposed excavation extents. These costs assumes that EMD will implement the RAW and does not include costs to prepare bid specifications and drawings.

It should be noted that the costs do not include demolition and pre-demolition abatement (e.g. lead-based and PCB-containing paint, asbestos containing material) of the existing buildings and Site structures, such as the wooden fence along the southwestern Site boundary, groundwater well abandonment, or post remediation groundwater sampling.

#### **4.3.8 AGENCY ACCEPTANCE**

DTSC approved the 2014 FS and concurred with the implementation of Alternative 5 (DTSC, 2014).

#### **4.3.9 COMMUNITY ACCEPTANCE**

Alternative 5 is likely to be favorably viewed by the community because it is effective in removing the areas with contaminated soil, eliminating risks to all human receptors by future land use, and will minimize any future degradation of groundwater from Site soils, thereby reducing the risk of impacts to the West Channel/Outer Harbor adjacent to the Site.

## SECTION 5

# REMOVAL ACTION IMPLEMENTATION

This section provides a description of the excavation approach to complete the removal action at the Site. Figures 4 through 9 presents the extents of the proposed excavation boundaries by proposed removal depths based on the data from previous Site soil investigations.

### 5.1 EXCAVATION LOCATIONS

The proposed excavations consist of soil samples that require removal (determined by UCL 95% simulations and PCB hot-spots) in order to achieve the RME for each COC below the Site cleanup goals. Adjacent borings with similar COCs have been connected. The vertical extent of each excavation is approximately 1.5 to 2 feet below the sample depth requiring removal.

It should be noted that no excavations will be conducted within the Machine Shop located in the northwestern corner of the Site and between the Site fence and Equipment Storage Building located in the southern corner of the Site. Soils in these areas will be removed in the future upon access. Additionally, any removal areas immediately adjacent to any onsite structures (buildings, retaining walls), will be carefully conducted and will be halted if the structural integrity is compromised. The excavations adjacent to these structures will be initially excavated to 2 ft bgs and continued upon evaluation of structural integrity as well as worker safety.

### 5.2 PRE-EXCAVATION ACTIVITIES

All required plans will be prepared and permits will be obtained before commencement of work. Mobilization will consist of procuring and transporting personnel, equipment, and supplies to the Site. The Contractor conducting the excavations will be a California licensed contractor with a Hazardous Substance Removal Certification and hold a valid California T1-Annual Trench/Excavation permit (issued by the California Department of Industrial Relations). In addition, all onsite workers will be 40 hour Hazardous Waste Operations (HAZWOPER) trained and current with the required 8 hour Annual Refresher Training in accordance with OSHA 29 CFR 1910.120.

#### 5.2.1 HEALTH AND SAFETY PLAN

A Site-specific Health and Safety Plan (HASP) will be prepared prior to the field implementation of this RAW. The HASP will be prepared in accordance with current health and safety standards as specified by the federal and California OSHAs standards to ensure worker safety. The HASP will be approved by and prepared under the direct supervision of a Certified Industrial Hygienist. Prior to implementation, the HASP will be submitted to the DTSC for review.

#### 5.2.2 WASTE MANAGEMENT PLAN

A Waste Management plan (WMP) will be prepared prior to implementation of the RAW and will outline the proper handling and management techniques for minimizing and disposing of waste to ensure:

- Excavation and sampling activities by Site workers shall in no manner contribute to a release of hazardous substance, hazardous materials, or hazardous waste to the environment (i.e., surface water, groundwater, soils, sediments, and air)
- Site workers' operations shall not contribute to the generation of hazardous waste except the excavated soil

Whenever feasible, the generation of waste will be reduced or eliminated to the extent. Adherence to the WMP should reduce the exposure to toxic and harmful materials, potential environmental liabilities, and protect the environment through efficient resource utilization and recycling programs.

### **5.2.3 PERMIT TO EXCAVATE**

A California Division of Occupational Safety and Health (also known as Cal-OSHA) permit to excavate will be obtained prior to the commencement of any intrusive work.

Additionally, while volatile organics are not a COC, the Contractor should hold a various location SCAQMD Rule 1166 permit in the event that VOC-impacted soil is encountered. During excavation, VOCs will be monitored in accordance with the Site-specific HASP and soil stockpiles will be monitored in compliance with SCAQMD Rule 1166 using a photoionization detector (PID). Procedures of VOC monitoring will be included in the HASP and all field measurements will be documented. Any Stockpile VOC reading greater than 50 parts per million will require notification to SCAQMD.

### **5.2.4 UTILITY NOTIFICATION/CLEARANCE**

A review and evaluation of available Site plans including utility layouts, as-built drawings, and results of previous investigations will be completed to assess potential conflicts with existing utilities within the removal areas. Underground Service Alert (USA) will then be contacted at least 48 hours prior to conducting intrusive field work to clear subsurface public utilities within the immediate vicinity of the excavation areas.

### **5.2.5 GEOPHYSICAL SURVEY**

Since limited as-built drawings are available of the Site, a geophysical survey will be conducted to identify and mark out any potential subsurface structures not identified by USA.

## **5.3 SOIL EXCAVATION AND MANAGEMENT**

### **5.3.1 SOIL EXCAVATION**

The final size and depth of the removal areas will be determined based on the confirmation soil sample results. However, for estimation purposes, Table 4 assumes volumes based on using a 5-foot by 5-foot lateral boundary for smaller individual excavations. The general work will involve using shovels (manual labor), a backhoe, excavator, or loader to remove impacted soil from the removal areas. Soils will be stockpiled or directly loaded into Department of Transportation (DOT)-approved end dump trucks or equivalent under uniform hazardous waste manifests for transportation to the designated disposal facility or facilities. Stockpiled soil will be located immediately next to the excavations and segregated by waste type. Stockpiled soil will be placed on plastic sheeting to protect against cross-contamination of soils beneath the stockpile. Secondary containment berms will be constructed using the same liner material to prevent storm water runoff from entering the stockpiles. The soil stockpiles will be covered with plastic sheeting and anchored to the ground by sand bags or similar material to prevent storm water runoff from the stockpiles leaving the bermed area. Additionally, any bins or stockpiles which contain or are found to contain PCB impacted soil will be kept onsite for less than 180 days in accordance with 40 CFR 761.65(c)(9). Storage for all excavated materials, as described above, will comply with onsite storage requirements per 40 CFR 761.65(c)(9).

If necessary, water will be sprayed on the excavations to minimize fugitive dust. Although onsite water supply has been turned off, a Harbor Department water line is located adjacent to the Site, north of the

personal lockers building and may be utilized upon permission from the City. Alternatively, a water truck will supply water for dust suppression.

Equipment will be first carefully dry decontaminated over the adjacent stockpiles using brushes. When this is not feasible, equipment will be taken to an onsite wash station for decontamination using either steam cleaning or a pressure washer for metals, PAH, and TPH excavations. In excavations of PCB-impacted soil, equipment will be decontaminated using hexane. The fluids generated during decontamination will be collected and later placed in drums for testing and proper disposal offsite. All excavation activities will be conducted in accordance with the site specific HASP.

Currently, the Site is bound along the harbor by a sea wall that extends from ground surface (8 ft above MLLW) to 6 feet bgs (2 ft above MLLW). Additionally, an approximate 1-foot high sand bag berm is constructed along the perimeter of the Site that is adjacent to the harbor and any exposed soil on Site is covered by tarps and sandbags. These measures are currently in-place and the berms will be inspected prior to the implementation of the RAW. Additional sand bags and plastic sheeting will be installed as needed to prevent the migration of contaminated soils into the harbor during the implementation of this RAW. Additionally, all shallow removals will be performed in dry conditions (above groundwater) and deep excavations (greater than 6.5 feet bgs) will occur during MLLW to avoid contact with groundwater. While not expected in excavations 6.5 feet deep or shallower, if groundwater is encountered, then the excavation will be paused until groundwater levels recede and allow for dry conditions. Depth to encountered groundwater will be noted and compared to the 2008 tidal study. It should be noted that any removals immediately adjacent to the sea wall will only be excavated to a depth of 6 ft bgs.

### 5.3.2 EXCAVATION DUST MONITORING

Dust monitoring will be conducted continuously during all excavation activities and in accordance with SCAQMD Rule 403. Dust monitoring will be conducted using a total of four (4) EPA approved stationary monitors, the TSI DustTrack II DRX Aerosol monitors (or equivalent), and placed around the perimeter of the Site so that one monitor will always be upwind and one monitor will always be downwind. Wind direction and speed will be monitored by an onsite mobile weather station or a nearby formal fixed weather station, (e.g., Berth 47 or Angel's Gate fixed stations) that can provide accurate wind speed and direction for the Site. Prior to the start of excavation activities, a baseline dust study will be conducted to determine the background dust levels at the Site. Dust monitors will be periodically checked during excavation activities to monitor for any values exceeding the established baseline/background dust levels plus 50 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ). When this occurs, the upwind and downwind data will be compared to determine if the difference in  $\text{PM}_{10}$  (particulate matter smaller or equal to 10 microns) levels is above the  $50 \mu\text{g}/\text{m}^3$  limit. If this limit is exceeded, then excavation activities will be halted until mitigation measures, such as spraying dust with water, have decreased the difference between the upwind and downwind  $\text{PM}_{10}$  levels to less than  $50 \mu\text{g}/\text{m}^3$ .

Truck traffic for export of soil will be conducted mostly on paved surfaces or plastic sheeting, so dust mitigation for track out is not expected to be necessary. In the case that track out becomes an issue, truck tires will be dry-decontaminated using brushes to remove any dirt on the tires prior to leaving the Site and a rumble strip (or equivalent) will be used. If the dry decontamination method is not effective, minimal amounts of water will be used to spray down the tires and the water will be collected, sampled, characterized, and disposed of offsite appropriately.

### 5.3.3 MANAGEMENT OF OPEN EXCAVATIONS

Once the removals reach their proposed depth, the excavations will remain open until the new RMEs and cumulative risks are calculated and criteria has been met for backfilling (*Section 5.3.4*). For onsite safety purposes, the following measures will be used to cordon off any open excavations.

- Small (i.e., 5 ft x 5 ft) excavations: caution tape and traffic cones or traffic barriers
- Larger excavations: temporary fencing

The order of removals and placement of stockpiles will be performed such that access to each location will not be impacted.

#### **5.3.4 CONFIRMATION SOIL SAMPLE COLLECTION AND RISK CALCULATION**

After soils are removed from each area, confirmation soil samples will be collected from the bottom and sidewalls of each excavation in accordance with the SAP (*Section 6*). The confirmation samples will be analyzed on a standard turnaround basis (5 business days or as designated by EMD) following the methods described in the Quality Assurance Project Plan (QAPP; Appendix A). The results of the confirmation samples will be combined with the concentrations of soil samples that have not been removed and new RMEs and cancer and non-cancer risks for all receptors will be calculated for each COC. The new RMEs cumulative risk will be compared to the cleanup goals and presented to DTSC and USEPA for review and approval prior to backfilling. For any RME exceeding the cleanup goals, locations for step-out removal will be identified such that the final RME is below the cleanup goal. Additionally, any individual sample exceeding the not-to-exceed limit for PCB, arsenic, lead, and/or mercury will be identified for removal until it is below the not-to-exceed limit. The excavations will be expanded (laterally and vertically) to remove the identified areas and confirmation samples will be collected. This pattern will be repeated until all RMEs meet the cleanup goals and cumulative cancer and non-cancer risks for all receptors are within acceptable ranges, and there are no further samples above the not-to-exceed limits for PCB, arsenic, lead, and mercury.

#### **5.3.5 BACKFILLING OF COMPLETED EXCAVATIONS**

Once DTSC and USEPA approve all RMEs and cumulative cancer and non-cancer risk calculations, and warrant that the excavation has been completed, the backfilling process will commence with the appropriate quantity of compacted fill material to restore the area to the pre-excavation grade. All of the excavations will be backfilled and compacted to 90% compaction (or otherwise designated by the Harbor Department) with clean excavated soil and/or clean imported fill. All import material will originate from a local quarry (e.g. Vulcan Materials or West Coast Sand and Gravel) and will meet the requirements set forth in the Site-Specific Import Fill Criteria, which are provided in Appendix B. Excavations impacted with groundwater will be backfilled with pea gravel or self-compacting stone to a level just above groundwater. Backfilling above the groundwater table will be conducted in 12-inch lifts and compaction will be performed using either a static sheepsfoot or vibratory roller. All backfilling and compaction activities will be performed in accordance with the most current edition of the *Standard Specifications Public Works Construction* (i.e., “Greenbook”).

#### **5.3.6 DISPOSAL OF EXCAVATED SOIL**

At the completion of the removal activities, each of the excavated soil stockpiles or bins will be properly sampled, characterized, and profiled for offsite disposal. Stockpiles or bins of the same contaminants, with the exception of PCBs, will be combined for sampling for waste characterization. The stockpile samples will be analyzed for the same constituents as the excavation confirmation samples and may include soluble metal analyses (California Waste Extraction Test and/or toxicity characteristic leaching procedure) to determine waste characterization. Additional analytes may be included upon request of the receiving landfill. For soil stockpiles or bins from PCB excavation areas, in-situ concentrations of PCBs will be used for waste characterization. The waste disposal facilities will be selected from a preferred list provided by Waste Management, depending on the characterization of each stockpile. The preference for nonhazardous contaminated waste will be Simi-Valley Landfill – Waste Management, Simi Valley, CA. The preference for non-RCRA hazardous waste, RCRA hazardous waste, and TSCA waste will be Chemical Waste



Management – Kettleman Hills, Kettleman City, CA. The final landfill choices will be made after receiving all waste characterization data and landfill choices may change based on this data.

#### **5.4 CONCRETE REMOVAL AND DISPOSAL**

Based on the soil removal locations, the concrete pad in the same area will be demolished, removed, and disposed offsite. This includes the following areas

- Concrete ramp located at Tt-SPBW-F6
- Concrete pad surrounding Tt-SPBW-D9-E
- Concrete pad between Tt-SPBW-14 and SPBW-RI-S6

Since the PCB concentrations of the concrete samples collected at Tt-SPBW-F9 and Tt-SPBW-D9-E were less than 50 ppm, these wastes may be disposed of as TSCA designated non-hazardous waste and disposed of accordingly. The concrete is designated to be disposed of at Waste Management's Simi Valley Landfill and will be analyzed for the compounds as required by the waste disposal facility. This waste disposal facility also requires a letter from the USEPA approving the RAW, which will be obtained and provided prior to disposal. This facility meets the disposal requirements listed in 40 CFR 761.61(a)(5)(v) as a fully permitted municipal solid waste landfill.

#### **5.5 FIELD VARIANCES**

Variances from the RAW will be communicated to DTSC and USEPA prior to any action being taken except for emergencies (when an immediate response is required). If confirmation sample results or observations during excavation indicate Site conditions are different from those conditions outlined in this workplan, or if implementation of a proposed excavation is not feasible, the Harbor Department will contact DTSC and USEPA, present the new information and propose tasks to address the new conditions. DTSC and USEPA will be notified if an emergency response is implemented. All field variances will be documented in the Removal Action Completion Report (RACR) prepared for the project.

#### **5.6 REMOVAL ACTION COMPLETION REPORT**

Once the cleanup goals of the RAW have been met, a Removal Action Completion Report will be prepared documenting the removal activities, field variances, confirmation soil sample results, final removal volumes, and disposition of excavated the soil and concrete.

#### **5.7 POST RACR GROUNDWATER SAMPLING**

Upon completion of all excavations, confirmation sampling, and backfilling, grab groundwater samples will be collected using a direct push drill rig (Geoprobe) in the center of the excavations greater than 5 ft by 5 ft. Samples will be collected and analyzed for Title 22 metals (dissolved and total), PCBs, and TPH to determine the post-soil excavation groundwater conditions. Analytical results will be compared to the 2006 and 2008 groundwater results to determine if the groundwater quality has improved, remained the same, or degraded. If it appears that groundwater quality has degraded, then the Harbor Department will evaluate whether additional action would be warranted to prevent further groundwater quality degradation.

## SECTION 6

# SAMPLING AND ANALYSIS PLAN

The proposed removal action will require the collection and analysis of samples to confirm the removal of impacted media to determine the proper waste classification of excavated soils and concrete for disposal purposes. All sampling will be conducted in general accordance with the applicable field procedures, QA/QC protocols, and QAPP presented in this RAW. In the following sections, confirmation sampling procedures and waste disposal classification sampling are described.

### 6.1 CONFIRMATION SAMPLING OF EXCAVATED AREAS

After soils are removed from each area, soil confirmation samples will be collected from the bottom and sidewalls of each excavation. Sidewall samples will be collected as follows:

- **Small Excavations (5 ft x 5 ft):** One sample from each sidewall at the midpoint of the excavation depth. For example, if an area is excavated to a depth of four feet, each sidewall sample would be collected at a depth of two feet. Additionally, a sample will be collected at a depth of 0.5 feet at each sidewall.
- **Large Excavations:** Sidewall confirmation samples will be collected every 10 linear feet along the walls of the excavation. The sidewall samples will be collected at a depth of 0.5 feet and at the midpoint of the excavation for removals down to 4 ft bgs. For removals greater than 4 feet in depth sidewall samples will be collected at a depth of 0.5 feet, the midpoint, and near the base of the excavation depth (approximately 6-inch to 1-foot above the base). Bottom confirmation samples will also be collected every 10 square feet of excavation bottom.
- **Excavation with Trench Box:** Excavation at TtSPBW-39 to a depth of 8 feet bgs will require the use of a trench box due to the proximity of the 12-inch diameter stormdrain. The trench box will be installed after excavating to a depth of 4 feet bgs. Confirmation samples will be collected at 0.5 and 4 feet prior to installation of the trench box. A hand auger with a slide hammer will be utilized to collect samples adjacent to the excavation to represent the 7-foot sidewall samples. The bottom sample at the center of the excavation will be collected through the use of the excavation bucket.

The sample locations and depths may vary depending on field observations (i.e. identification of fine-grained soil, staining, etc.). Figures 10a, 10b, and 10c present the proposed confirmation soil sample locations for the larger removal areas. Figure 10d presents the confirmation soil samples for a typical 5-foot by 5-foot (25 square foot) excavation.

The confirmation samples will be analyzed on a standard turnaround basis (5 business days or as designated by EMD) using the applicable USEPA Method (depending on whether the COCs for the particular excavation are metals, PCBs, TPH, or PAHs). As described in *Section 5.3.4*, the confirmation samples will be utilized to evaluate the Site for the need for additional excavation.

If an excavation is expanded, then additional confirmation sample(s) will be collected from the same horizontal and vertical location(s) for lateral expansions. Confirmation samples will be collected from new excavation bottoms for vertical expansions. The new verification sample will be named with the original verification sample name, additional direction for lateral expansions, followed by the depth of the new verification sample relative to the original (unexcavated) ground surface.

## 6.2 SAMPLE COLLECTION PROCEDURES

All confirmation soil samples will be collected with hand trowels either directly from the excavation or from the excavation equipment described below and will be discrete samples. Confirmation samples for PCBs will be in accordance with 40 CFR Part 761, Subpart O, with the exception that discrete samples will be collected for verification sampling, not composite samples.

### 6.2.1 DIRECT COLLECTION FROM EXCAVATION

When personnel can safely enter the excavation, confirmation samples will be collected as follows:

- Place the blade tip of trowel into the soil and push firmly until a sampling depth of approximately three inches is reached.
- If sampling a cohesive soil, it may be necessary to remove the trowel and reinsert it to further loosen the soil.
- When the soil has been sufficiently loosened, lift a portion of the soil out with the blade and transfer the soil to a sample container using the sampling trowel.
- When sampling for VOCs or TPH-gasoline range (C<sub>6</sub>-C<sub>12</sub>), soil will be collected directly from sidewall or bottom soil using an EnCore, TerraCore, or equivalent sampler to prevent vapor loss during sampling activities.
- Label the sample, place in a sealable plastic bag, and place in a cooler with ice as a preservative.

### 6.2.2 COLLECTION FROM EXCAVATION EQUIPMENT

When personnel cannot safely enter the excavation, confirmation samples will be collected from excavation equipment (such as the bucket of an excavator or backhoe) as follows:

- Direct the excavation equipment to scoop soil from the predetermined sampling location.
- Wait until the excavation equipment has lifted the bucket to stable, flat ground and placed the bucket on the ground.
- Use the trowel to collect the soil from the center of the bucket, in order to avoid cross-contamination from the excavation equipment, and transfer the soil to a sample container using the sampling trowel.
- When sampling for VOCs or TPH, soil will be collected directly from the center of the bucket using an EnCore, TerraCore, or equivalent sampler to prevent vapor loss during sampling activities.
- Label the sample, place in a sealable plastic bag, and place in a cooler with ice as a preservative.

### 6.2.3 HAND AUGER SAMPLE COLLECTION AT TtSPBW-39

Since the trench box at location TtSPBW-39 will prevent access to sidewalls, a hand auger with a slide hammer will be utilized. A hand-auger consists of a stainless-steel barrel and bit assembly connected to a handle. Undisturbed soil samples at one foot above the base of the excavation will be collected by driving a 6-inch long, 2-inch diameter steel slide hammer sampler containing two new 3-inch by 2-inch stainless steel sample sleeves, or one 6-inch by 2-inch stainless steel sample sleeve.

- The sampler will be driven into the undisturbed soil using the repeated hammering action of a slide hammer.
- Upon retrieval of the sampling sleeves, cap the sleeves with Teflon™ and plastic end caps.

- Label the sample, place in a sealable plastic bag, and place in a cooler for transportation to the analytical laboratory.

#### **6.2.4 EQUIPMENT DECONTAMINATION**

The trowel and hand auger used to collect confirmation samples for metal, PAH, and TPH analyses will be decontaminated prior to use at each sampling location by utilizing a triple-rinse procedure, as follows:

- The equipment will be washed with non-phosphate detergent and potable water.
- The equipment will be rinsed with potable water.
- The equipment will be rinsed with distilled water.
- The equipment will be allowed to air dry.

When collecting confirmation samples for PCB analysis, the trowel will be decontaminated using hexane as outlined in Section 11 of the USEPA Standard Operating Procedure for sampling porous Surfaces for PCBs (USEPA, 2011), which is included as Appendix C. This will be conducted in accordance with 40 CFR 761.79(c)(2).

All decontamination fluids generated during the implementation of the RAW will be stored in United Nations/DOT-approved drums and analyzed for waste classification, as described in *Section 6.4*.

### **6.3 CONFIRMATION SAMPLE ANALYSES**

Confirmation samples will be analyzed by the following methods and will vary based on the COCs for each excavation listed in Table 4. However, excavations that contain one or more metal COC will be analyzed for all six metal COCs (antimony, arsenic, copper, lead, zinc, and mercury). The COCs per excavation location are noted in Table 4. The analytical methods selected are:

- Antimony, arsenic, copper, lead, and zinc by USEPA Method 6010B
- Mercury by USEPA Method 7147A
- PAHs by USEPA Method 8310
- PCBs by USEPA Method 8082 with soxhlet extraction by USEPA Method 3540C
- TPH-gasoline carbon chain range (C<sub>6</sub>-C<sub>12</sub>) by USEPA Method 8015B with sample collection Method 5035
- TPH-diesel carbon chain range (C<sub>9</sub>-C<sub>25</sub>) by USEPA Method 8015B
- TPH-motor oil carbon chain range (C<sub>24</sub>-C<sub>40</sub>) by USEPA Method 8015B
- Dioxins and furans as 2,3,7,8-tetrachlorodibenzodioxin (TCDD) equivalent by USEPA Method 8280A

All sample analytical results will be reported on a dry weight basis, correcting for moisture content, and in mg/kg.

### **6.4 FIELD QUALITY CONTROL SAMPLING**

Field duplicate samples, at a rate of 10 percent (10%), will be collected and analyzed for the same constituents as the parent sample. It should be noted that when calculating the RME post excavation, only the higher concentration between the parent samples and the field duplicate sample will be used.

Equipment blanks will be collected daily from reusable, non-disposable sampling equipment. The QAPP in Appendix A provides a detailed description of the field quality control sampling.

## **6.5 WASTE DISPOSAL CLASSIFICATION SAMPLING**

### **6.5.1 EXCAVATED SOIL**

Excavated soil will be profiled to ensure appropriate disposal. The sample frequency will be approximately one sample per 250 cubic yards of soil, and the following analyses will be performed:

- Title 22 metals (USEPA Method 6010B/7147A)
- TPH (USEPA Method 8015B)
- VOCs (USEPA Method 8260B)

Samples that exceed hazardous regulatory screening criteria of ten times STLC and/or 20 times the toxicity characteristic leaching procedure (TCLP) will be analyzed for soluble concentrations. All PCB-contaminated soil will be disposed of in accordance with 40 CFR 761.61(a)(5)(B) based upon in-situ sample concentrations.

### **6.5.2 DECONTAMINATION WATER**

Decontamination water will be containerized, sampled, and characterized to ensure appropriate disposal. The following analyses will be performed:

- Title 22 metals (USEPA Method 6010B)
- TPH (USEPA Method 8015)
- VOCs (USEPA Method 8260B)
- PCBs (USEPA Method 8082)

Based on the waste characterization, an appropriate disposal facility will be determined. Decontamination solvents will be handled in accordance with 40 CFR 761.79(d).

## **6.6 INVESTIGATION-DERIVED WASTE HANDLING**

Due to the nature of the equipment proposed for the confirmation soil sampling activities, minimal investigation-derived waste (IDW) will be generated during decontamination. All decontamination water generated during the investigation will be stored in United Nations/DOT-approved drums and analyzed for waste classification. The drums will be labeled using a permanent, paint-based marker on pre-printed labels. The labels will indicate the date of generation, drum number, source (boring number), and material inside the drum (decontamination water or soil cuttings). The drums will be consecutively numbered for IDW management. Used personal protective equipment (PPE) will be disposed of as non-hazardous waste. At the completion of the removal activities, the drum contents will be sampled, characterized, profiled and properly manifested and disposed offsite. All PPE associated with PCB excavations will be disposed of in accordance with 40 CFR 761.61(a)(5)(B)(v).

## **SECTION 7**

### **PUBLIC PARTICIPATION**

The public participation requirements for the RAW process includes:

- The development of a community profile, which was completed by DTSC in February 2016 upon receipt of responses to the community survey in December 2015.
- Publishing a notice of the availability of the Removal Action Workplan for public review and comment.
- Making the RAW and other supporting documents available at the DTSC's office and in the local information repository.
- Responding to public comments received on the RAW and CEQA documents.

A community profile has been prepared by DTSC to help evaluate the public participation efforts necessary for the Site. It is anticipated that the public participation tasks will include mailing fact sheets to local residents and merchants and publication of public notices in local newspapers. All public participation activities will be conducted by or under the direction of DTSC's Public Participation Specialist (Mr. Tim Chauvel). Once the public comment period is completed, DTSC will review and respond to the comments received. The RAW will be revised, as necessary, to address the comments received. If significant changes to the RAW are required, the RAW will be revised and be resubmitted for public review and comment. If significant changes are not required to the RAW, then the RAW will be modified and DTSC will approve the modified RAW for implementation.

## **SECTION 8**

# **CALIFORNIA ENVIRONMENTAL QUALITY ACT DOCUMENTATION**

The California Environmental Quality Act (CEQA), modeled after the National Environmental Policy Act of 1969, was enacted in 1970 as a system of checks and balances for land-use development and management decisions in California. It is an administrative procedure to ensure comprehensive environmental review of cumulative impacts prior to project approval. It has no agency enforcement tool, but allows challenge in courts.

A CEQA project is a project that has a potential for resulting in a direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment. CEQA applies to all discretionary projects proposed to be carried out or approved by California public agencies, unless an exemption applies.

Currently, buildings onsite are considered historical and not included in the RAW. Excavation boundaries for the RAW will stop at the edge of the buildings and soil contaminations beneath the buildings, if any, will be addressed during future redevelopment. In addition, other onsite structures such as the remaining turntable and metal tracks are considered contributors of the historical status for the area. Excavation will require removing portions of the remaining turntable and metal tracks.

In accordance with CEQA, the DTSC is preparing the necessary documentation and public notification to ensure that the requirements are satisfied. This includes an Initial Study, which provide a preliminary analysis of the proposed removal action to determine whether a Negative Declaration or an Environmental Impact Report should be prepared. The results of the Initial Study will be provided as an addendum to this RAW.

## SECTION 9

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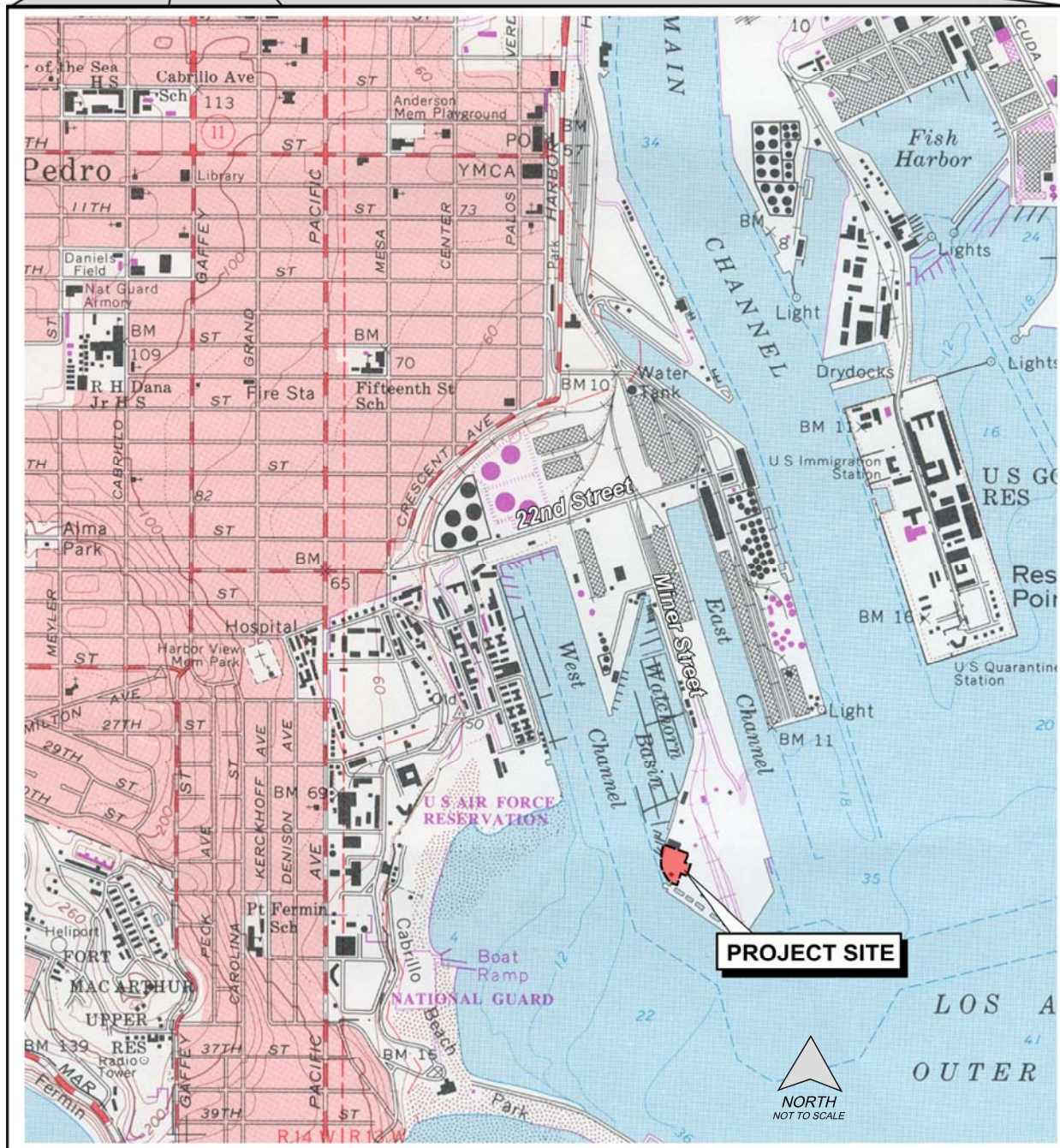
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- \_\_\_\_\_. Remediation Technologies Screening Matrix and Reference Guide, Version 4.0. <http://www.frtr.gov/matrix2/sitemap.html>

# FIGURES



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PROGRAM MANAGER:	H.B.
PREPARED BY:	C.K.
PROJECT MANAGER:	R.S.

Prepared By:

**Tetra Tech**  
3475 E. Foothill Blvd.  
Pasadena, California 91107

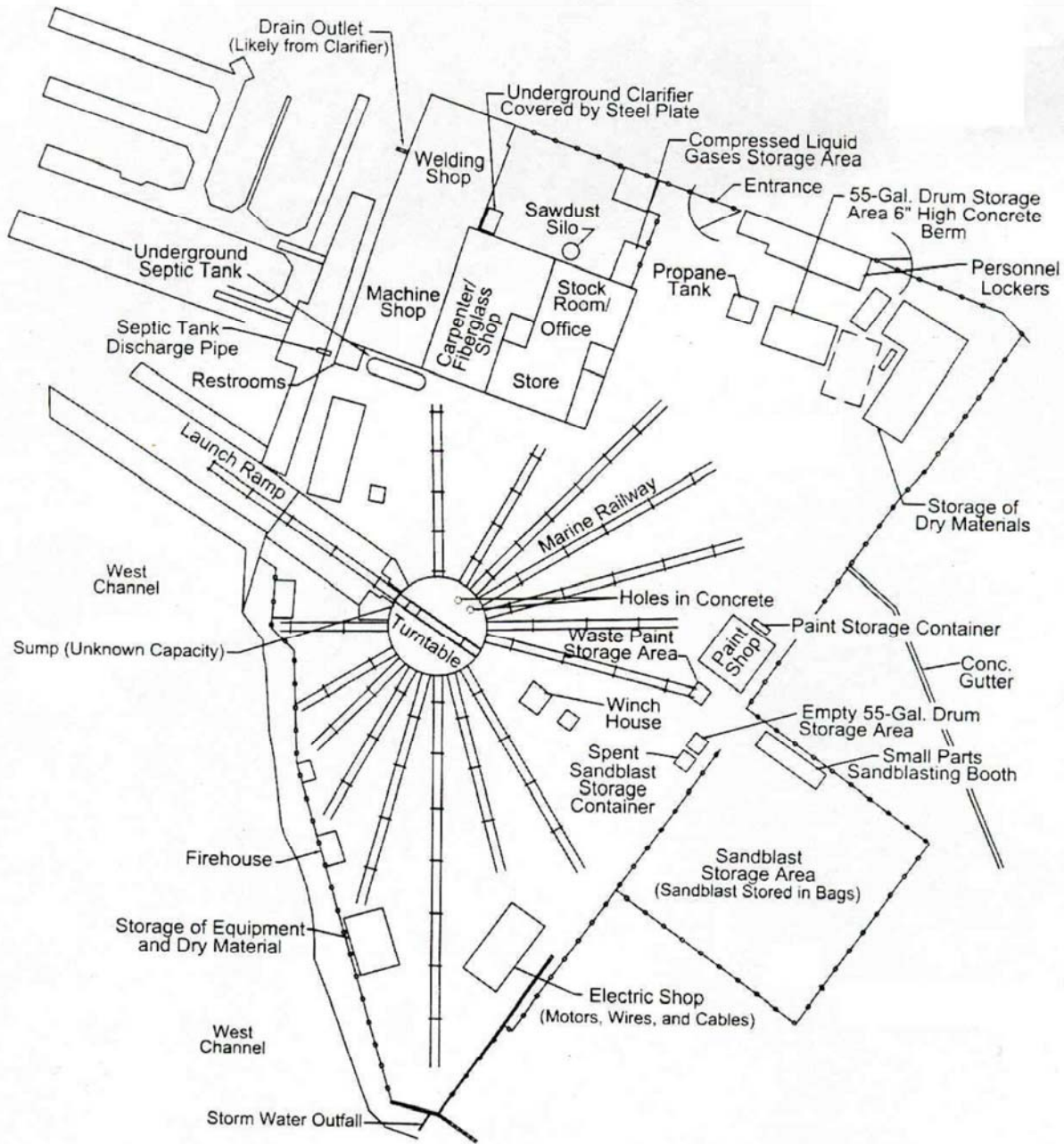
Prepared For:

**Environmental Management Division**  
**PORT OF LOS ANGELES**  
425 South Palos Verdes St.  
San Pedro, CA 90733-0151

**FIGURE 1**  
**SITE LOCATION MAP**

DATE	February 2017
SCALE	NOT TO SCALE
PROJECT NUMBER	TC43245.23





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PROGRAM MANAGER:	H.B.
PREPARED BY:	C.K.
PROJECT MANAGER:	R.S.



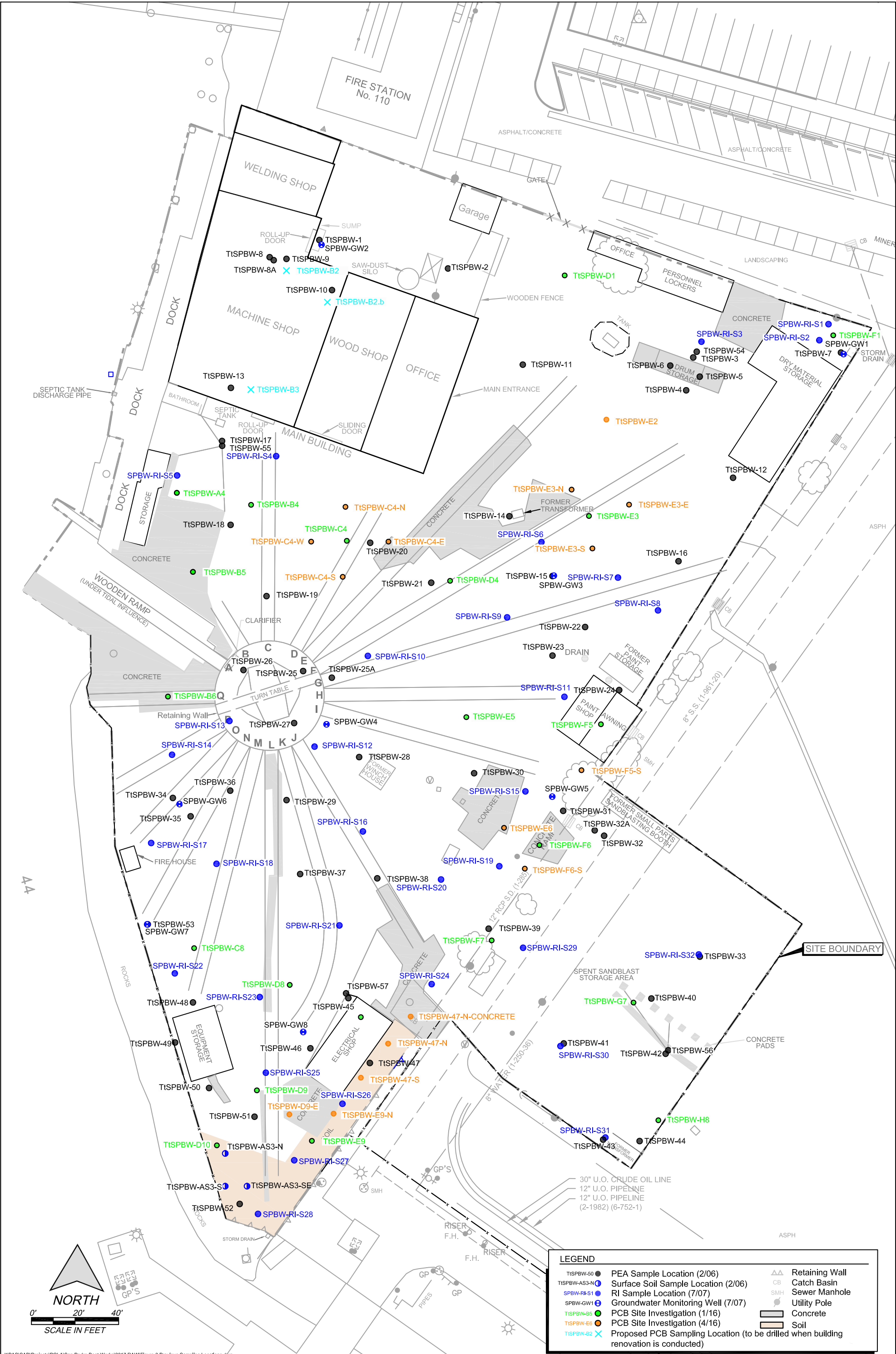
**Tetra Tech**  
3475 E. Foothill Blvd.  
Pasadena, California 91107



**Environmental Management Division**  
**PORT OF LOS ANGELES**  
425 South Palos Verdes St.  
San Pedro, CA 90733-0151

**FIGURE 2**  
**HISTORICAL SITE LAYOUT**  
**BERTH 44**

DATE	February 2017
SCALE	NOT TO SCALE
PROJECT NUMBER	TC43245.23



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PROGRAM MANAGER: H.B.  
PREPARED BY: J.K.  
PROJECT MANAGER: R.S.  
REVISION DATE: February 28, 2017



**Tetra Tech**  
3475 E. Foothill Blvd.  
Pasadena, California 91107

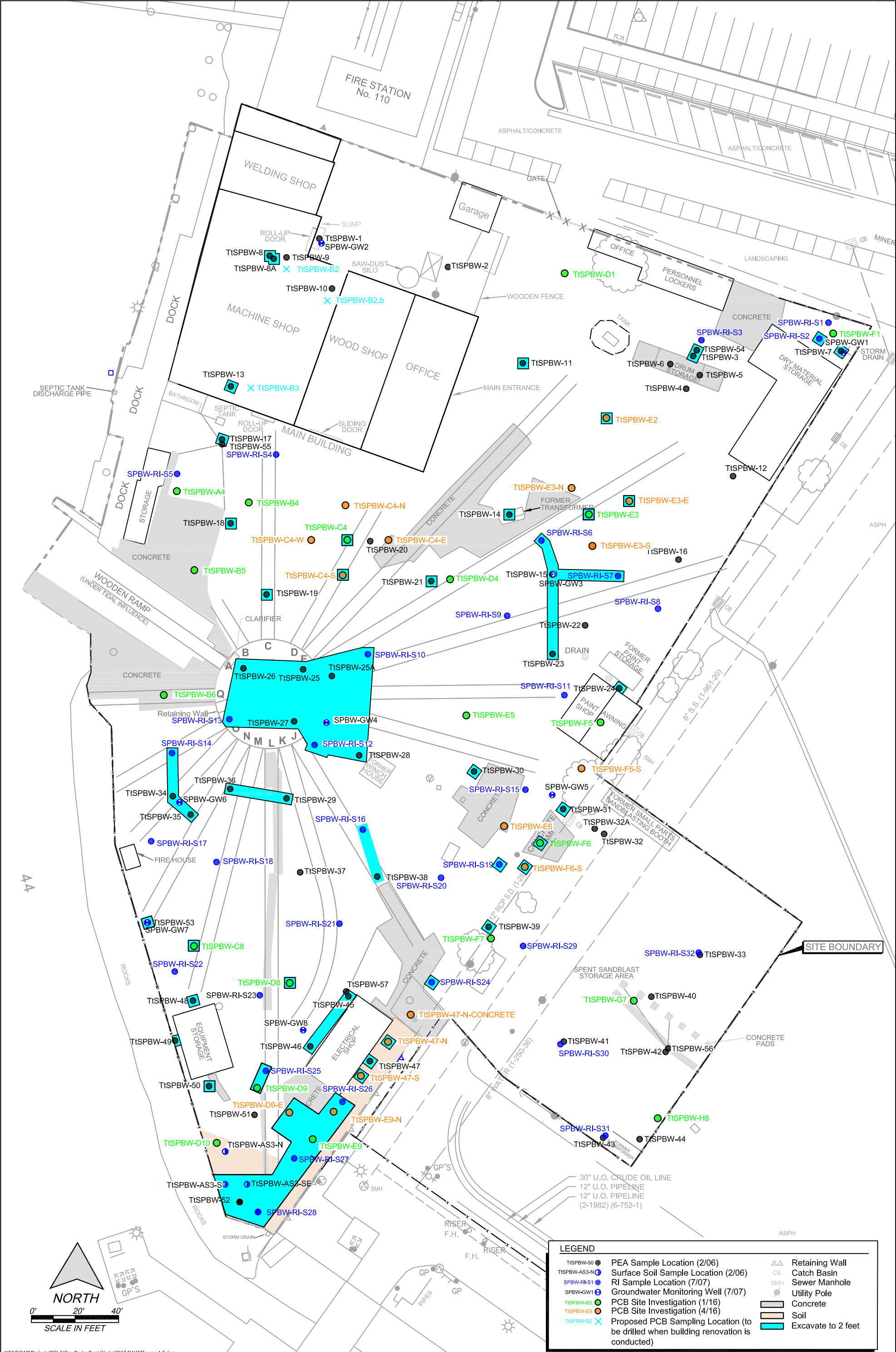


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425 South Palos Verdes St.  
San Pedro, CA 90733-0151

**Figure 3**  
Previous Sampling Locations

DATE: February 2017  
SCALE: 1"=40'  
PROJECT NUMBER: TC43245.23





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PROGRAM MANAGER: H.B.  
PREPARED BY: J.K.  
PROJECT MANAGER: R.S.  
REVISION DATE: February 28, 2017



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3475 E. Foothill Blvd.  
Pasadena, California 91107

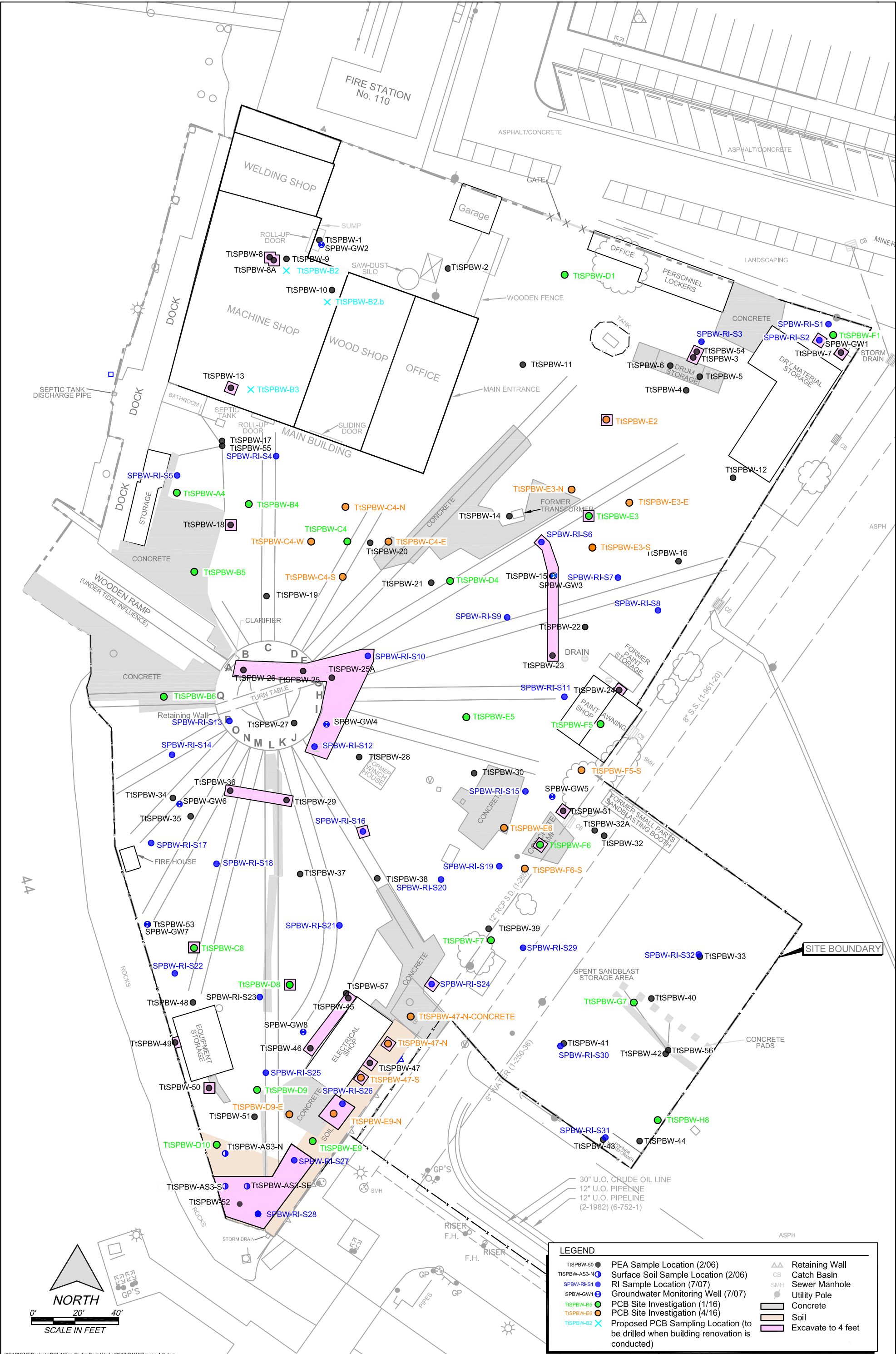
Prepared For:



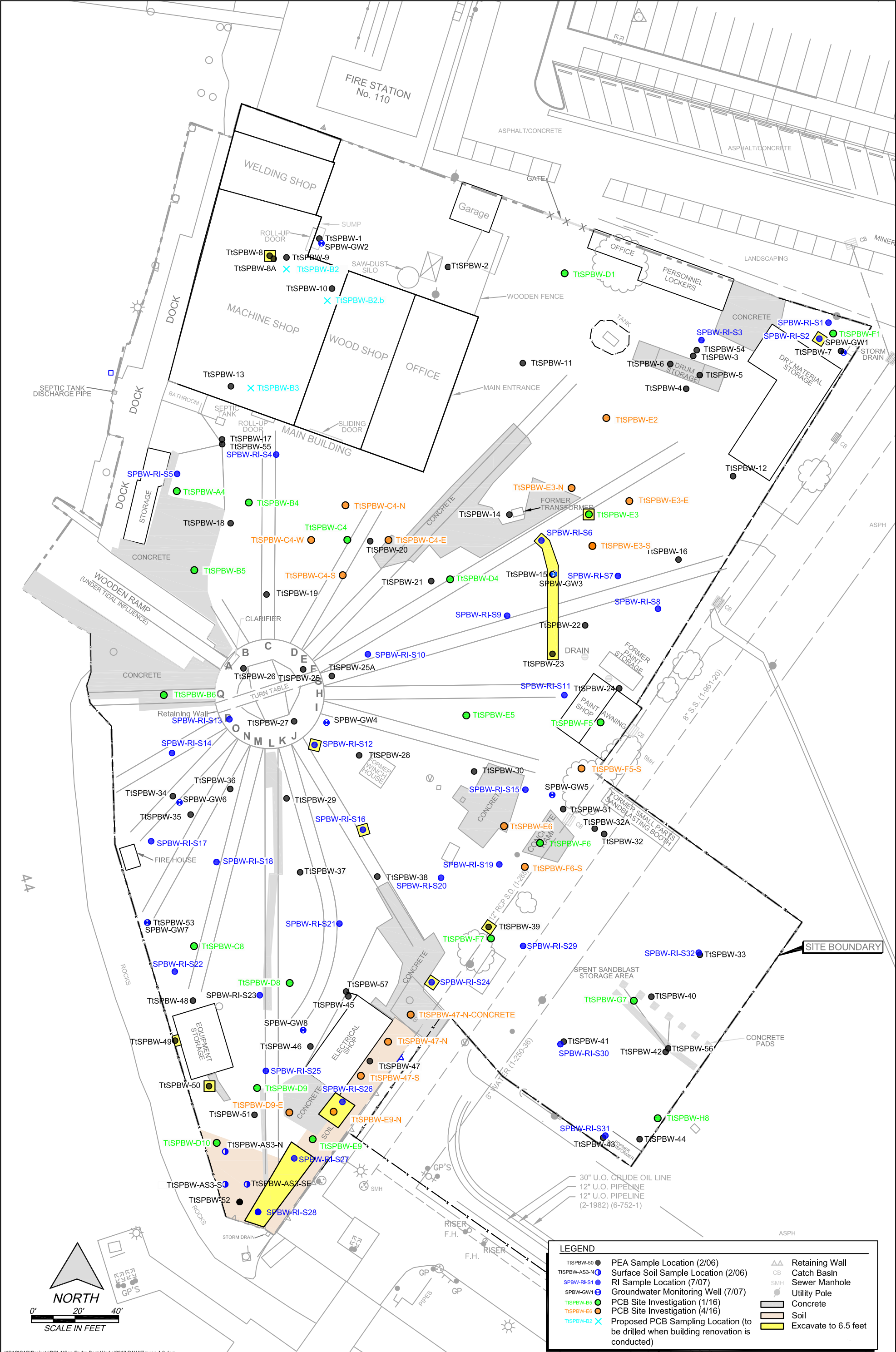
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**Environmental Management Division**  
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San Pedro, CA 90733-0151

**Figure 4**  
**Excavation Areas - Surface Soils (0.0 to 2.0 feet)**

DATE: February 2017  
SCALE: 1"=40'  
PROJECT NUMBER: TC43245.23







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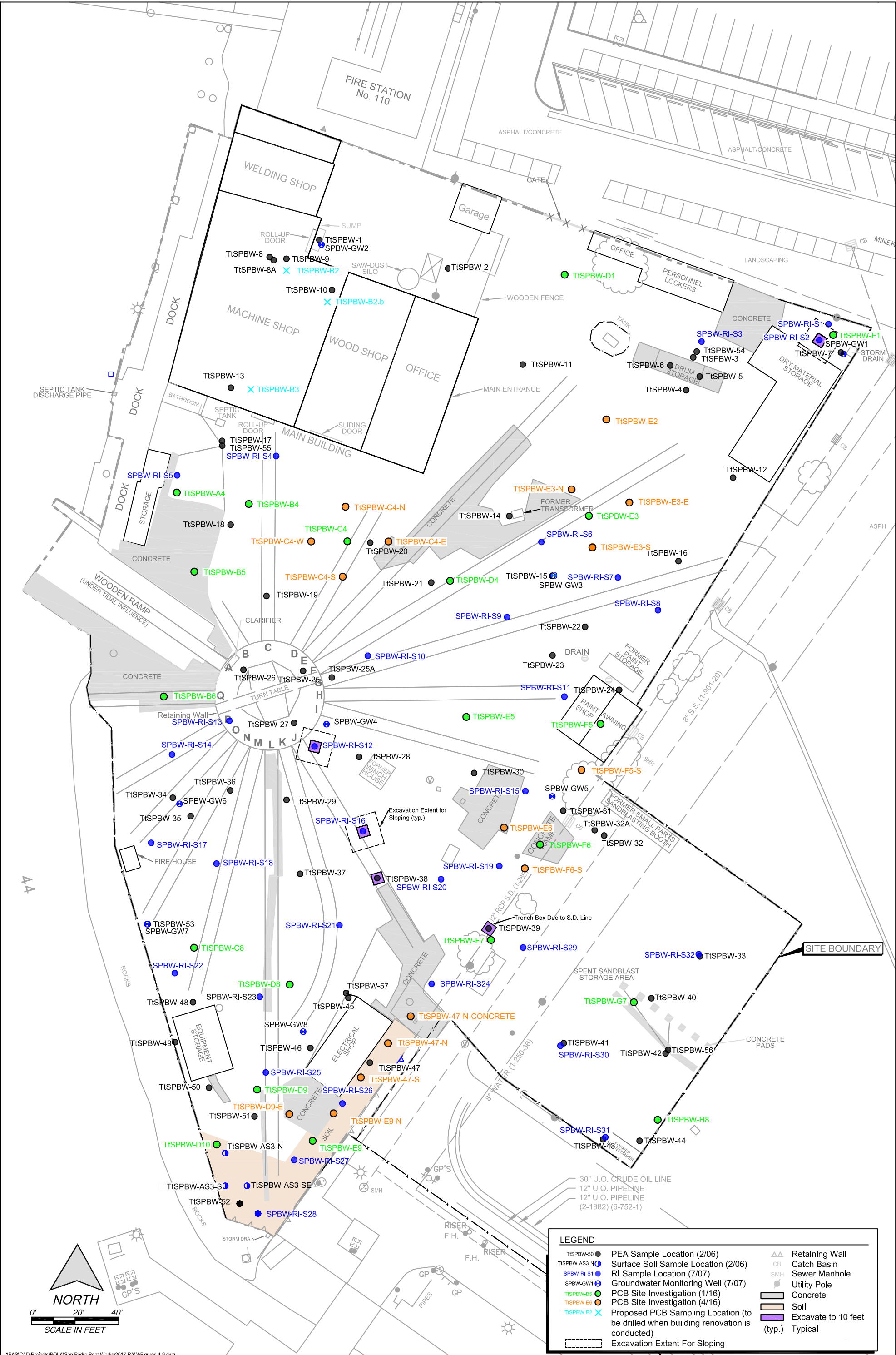
PROGRAM MANAGER: H.B.  
PREPARED BY: J.K.  
PROJECT MANAGER: R.S.  
REVISION DATE: February 28, 2017

**Tetra Tech**  
3475 E. Foothill Blvd.  
Pasadena, California 91107

Prepared For:  
**PORT OF LOS ANGELES**  
Environmental Management Division  
425 South Palos Verdes St.  
San Pedro, CA 90733-0151

Figure 6  
Excavation Areas - Intermediate Soils (4.0 to 6.5 feet)

DATE: February 2017  
SCALE: 1"=40'  
PROJECT NUMBER: TC43245.23



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PROGRAM MANAGER: H.B.  
PREPARED BY: J.K.  
PROJECT MANAGER: R.S.  
REVISION DATE: February 28, 2017

**Tetra Tech**  
3475 E. Foothill Blvd.  
Pasadena, California 91107

Prepared For:  
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Environmental Management Division  
425 South Palos Verdes St.  
San Pedro, CA 90733-0151

Figure 7  
Excavation Areas - Deep Soils (6.5 to 10.0 feet)

DATE: February 2017  
SCALE: 1"=40'  
PROJECT NUMBER: TC43245.23



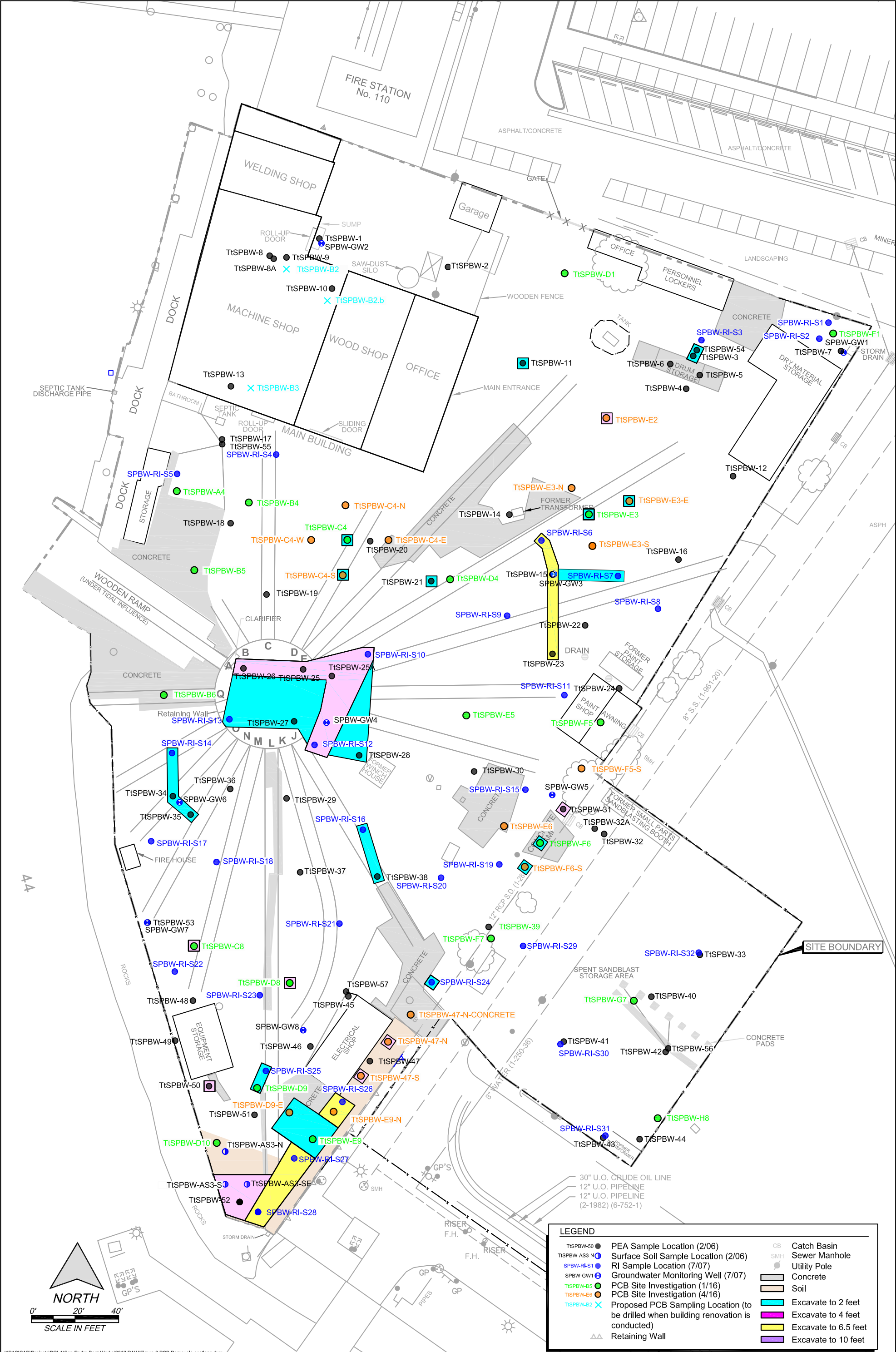
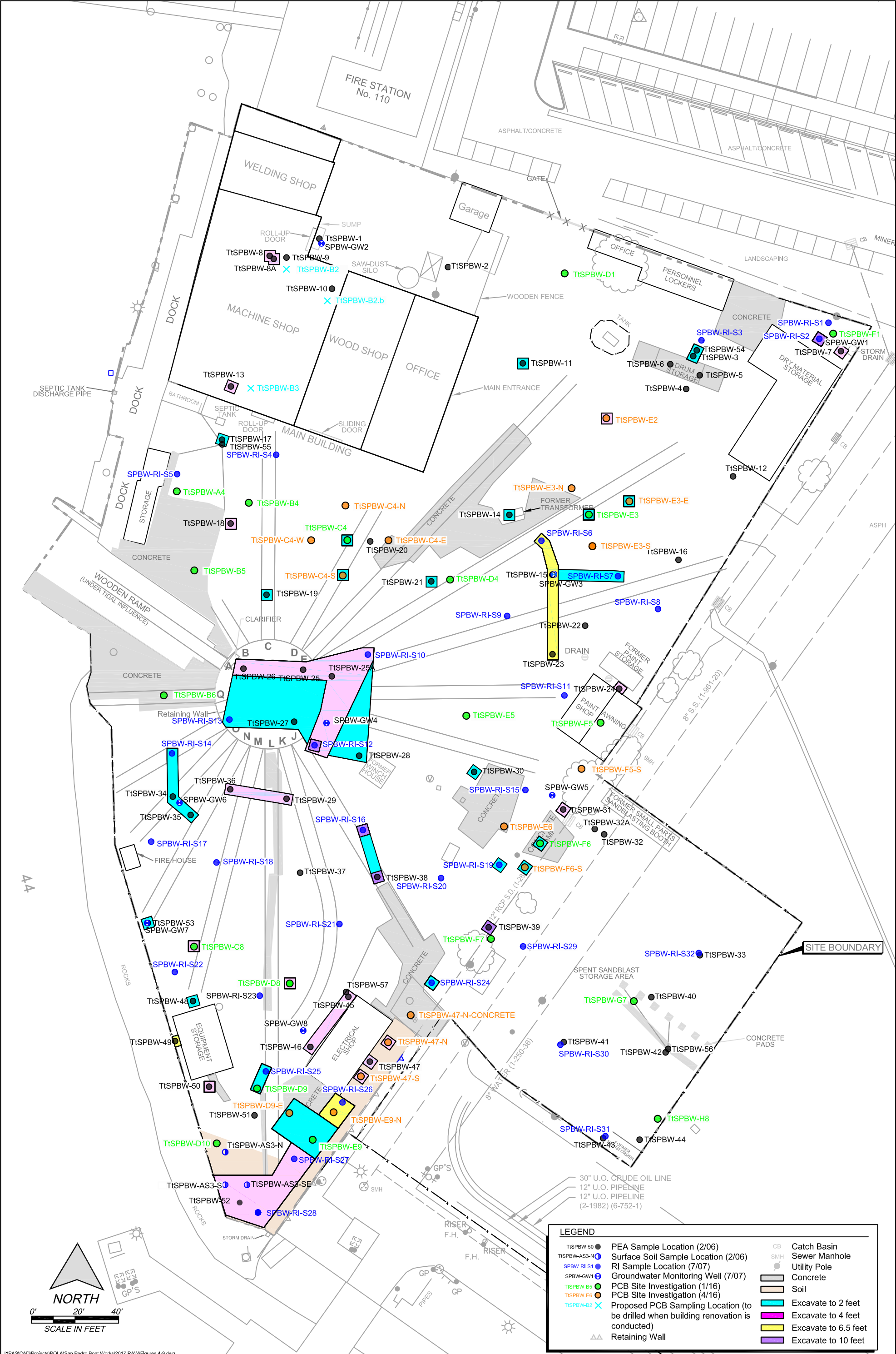


Figure 8  
PCB Removal Locations



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PROGRAM MANAGER: H.B.  
PREPARED BY: J.K.  
PROJECT MANAGER: R.S.  
REVISION DATE: February 28, 2017

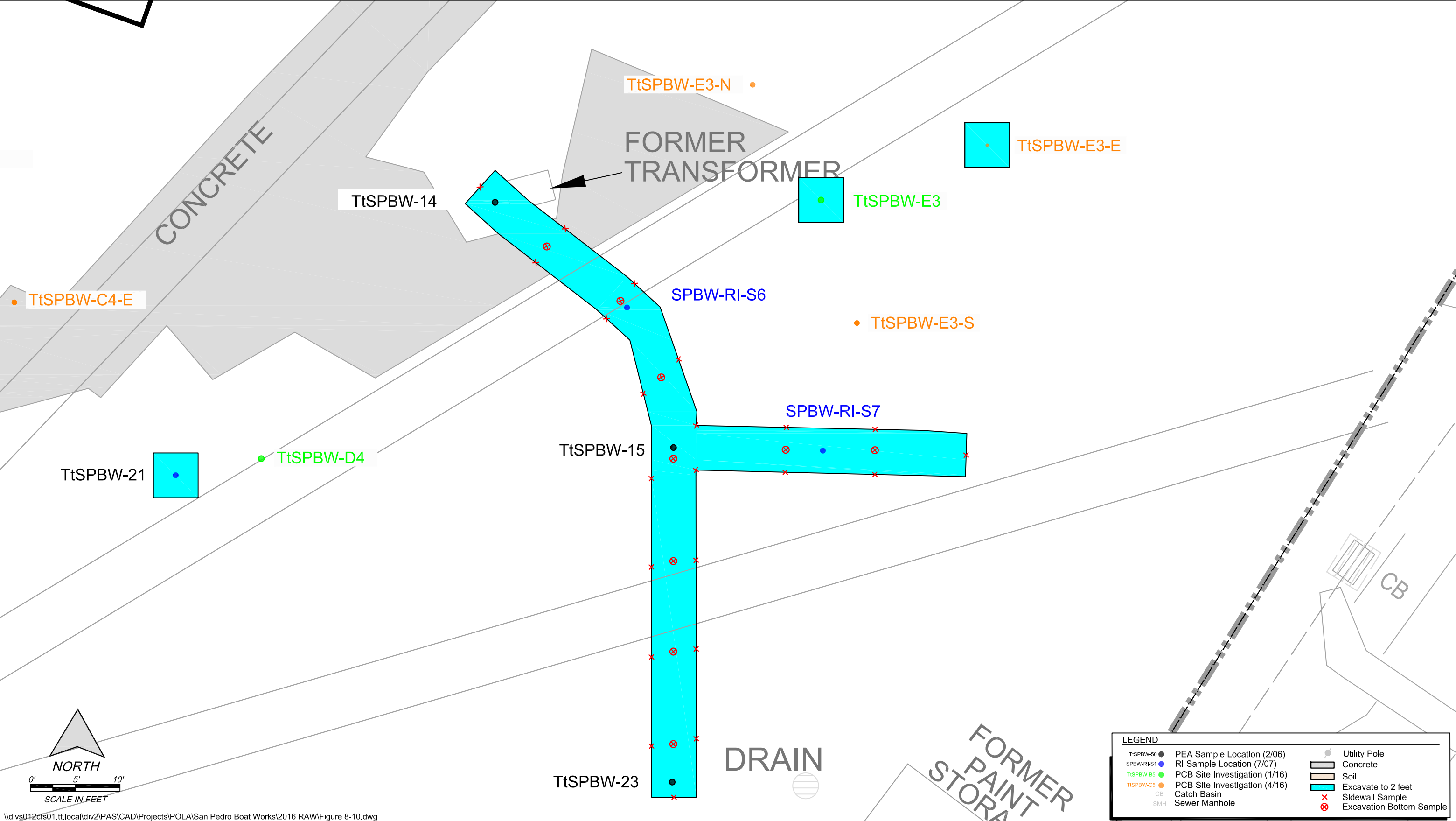
**Tetra Tech**  
3475 E. Foothill Blvd.  
Pasadena, California 91107

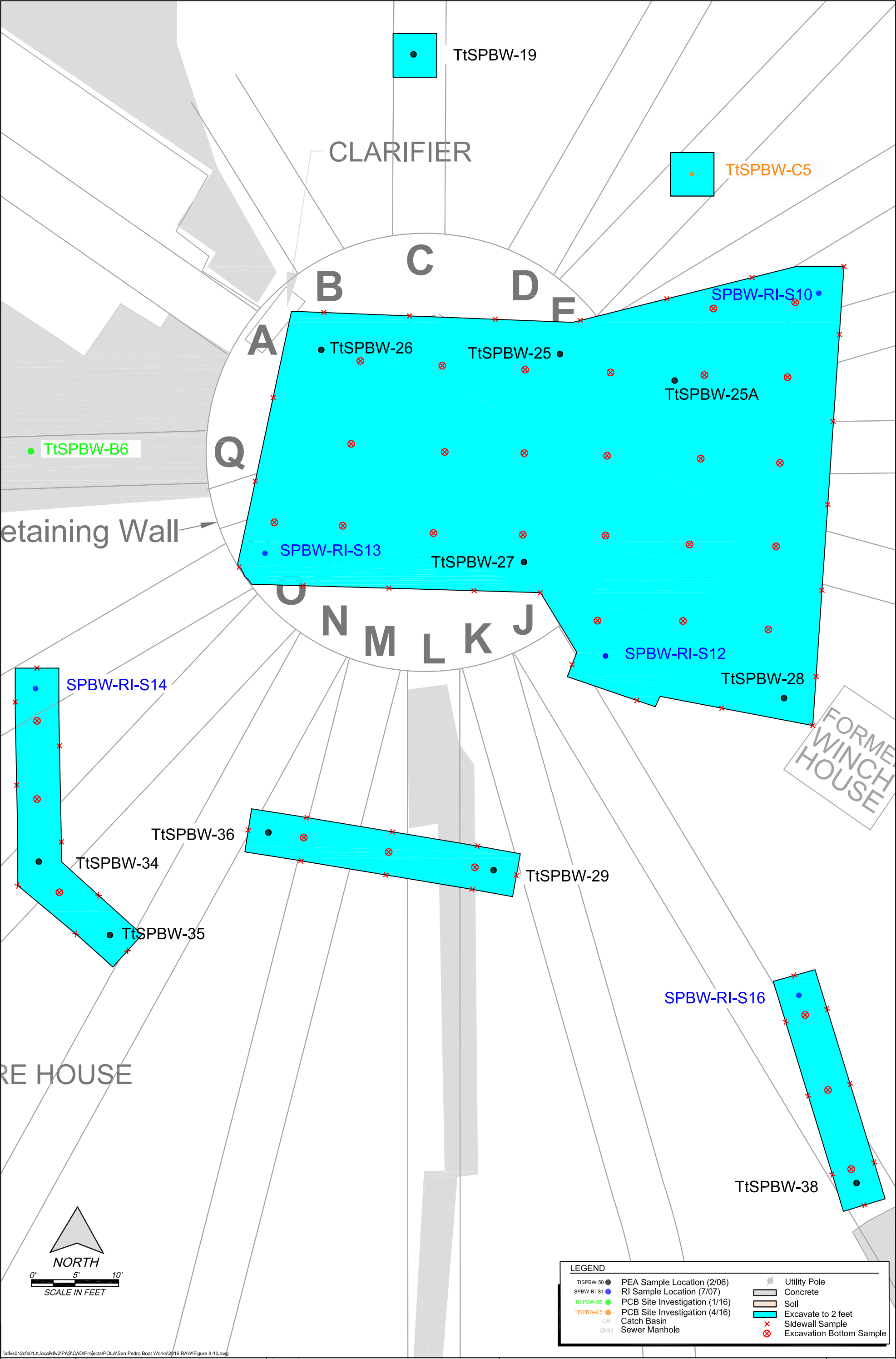
Prepared For:  
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Environmental Management Division  
425 South Palos Verdes St.  
San Pedro, CA 90733-0151

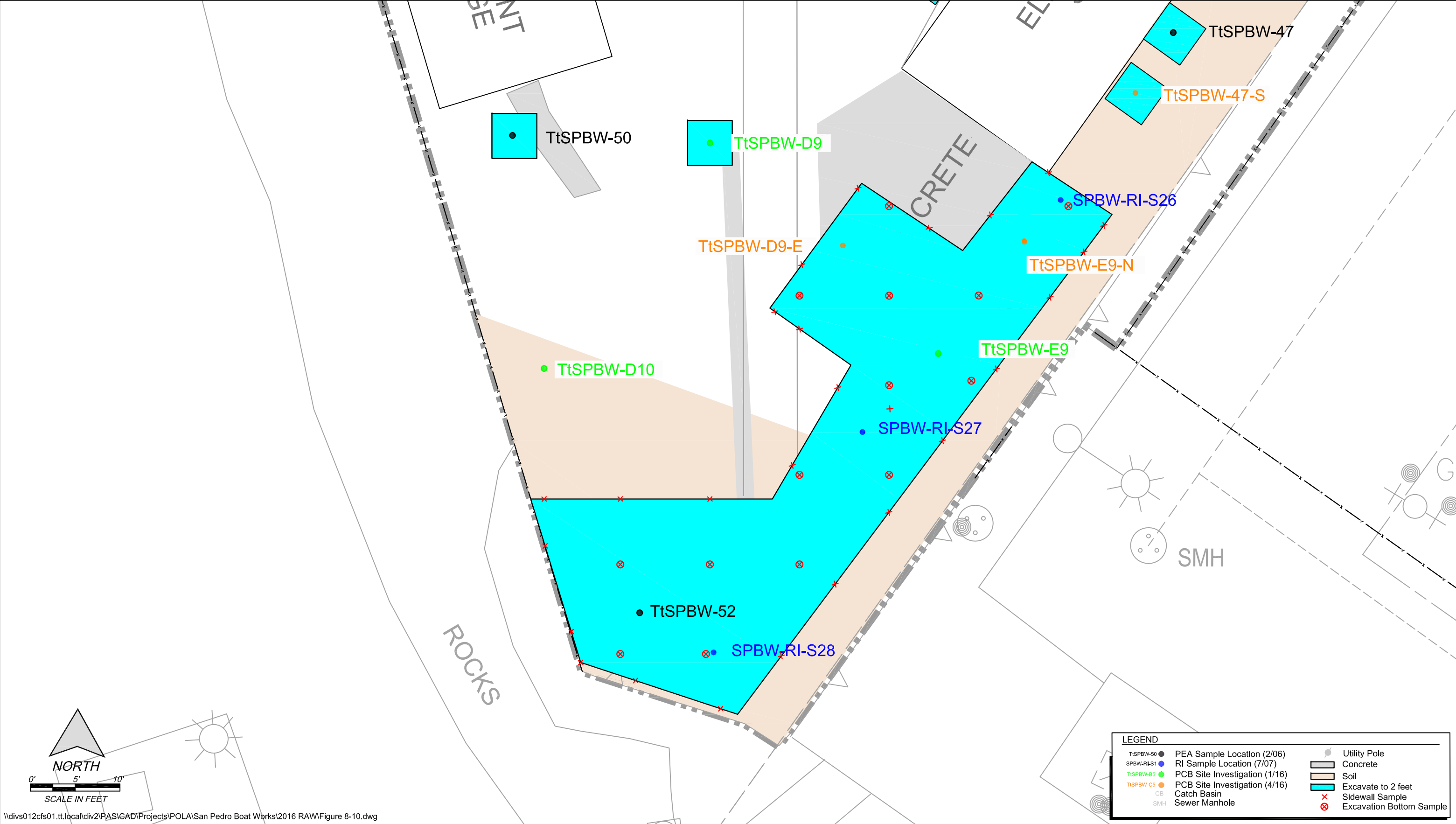
Figure 9  
All Excavation Areas - (0.0 to 10.0 feet) bgs

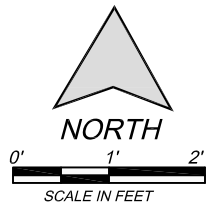
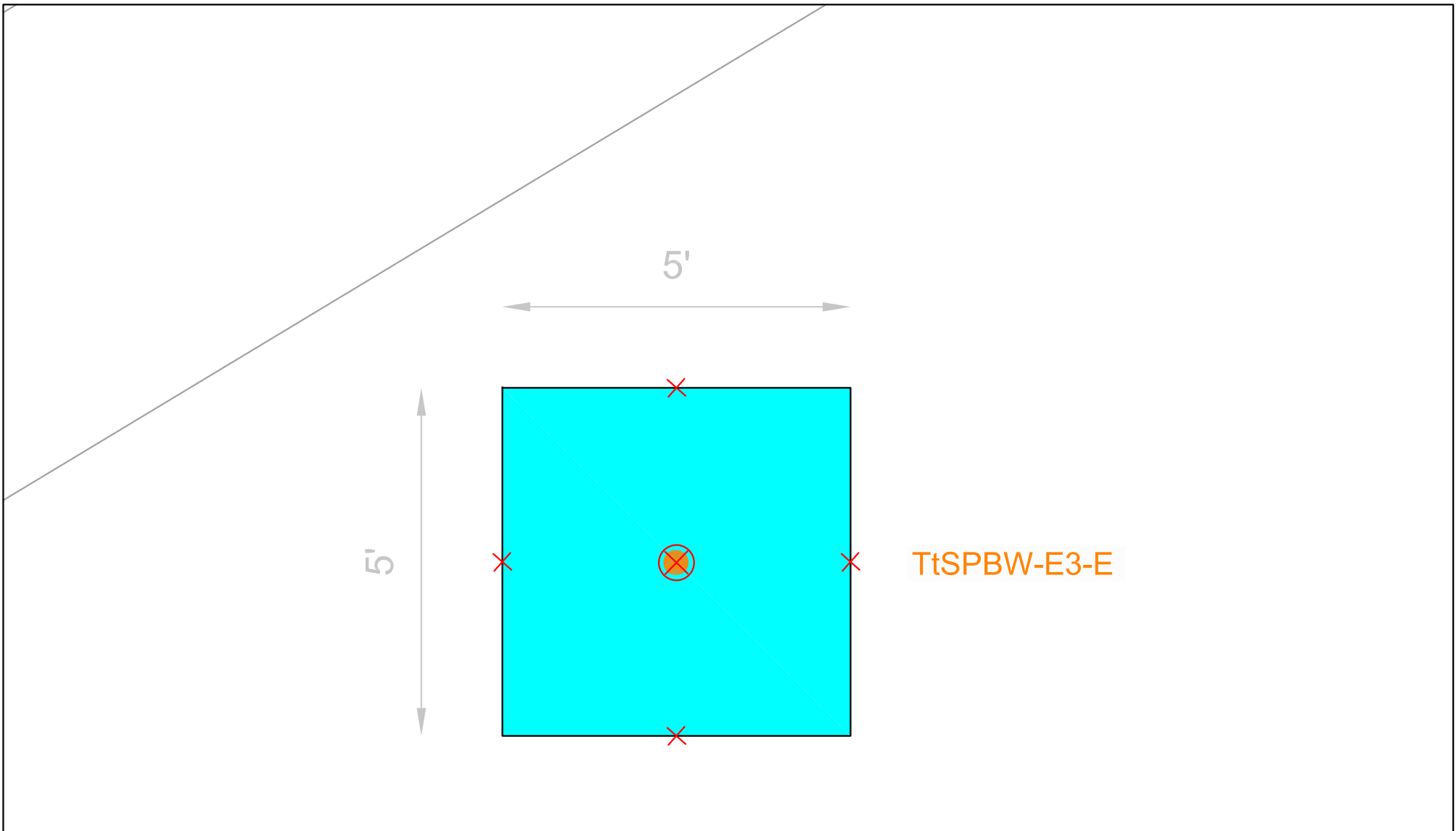
DATE: February 2017  
SCALE: 1"=40'  
PROJECT NUMBER: TC43245.23











LEGEND				
TSPBW-50	●	PEA Sample Location (2/06)	☎	Utility Pole
SPBW-RI-S1	●	RI Sample Location (7/07)	▬	Concrete
TSPBW-B5	●	PCB Site Investigation (1/16)	▬	Soil
TSPBW-C5	●	PCB Site Investigation (4/16)	▬	Excavate to 2 feet
CB		Catch Basin	✕	Sidewall Sample
SMH		Sewer Manhole	⊗	Excavation Bottom Sample

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PROGRAM MANAGER:	H.B.
PREPARED BY:	J.K.
PROJECT MANAGER:	R.S.
REVISION DATE:	February 16, 2017

Prepared By:



**Tetra Tech**  
3475 E. Foothill Blvd.  
Pasadena, California 91107

Prepared For:



**PORT OF LOS ANGELES**  
**Environmental Management Division**  
425 South Palos Verdes St.  
San Pedro, CA 90733-0151

**Figure 10d**  
**Proposed Confirmation Sample Locations**  
**(Typical 5 ft by 5 ft Excavation)**

DATE	February 2017
SCALE	1"=10'
PROJECT NUMBER	TC43245.23



# TABLES

**Table 1**  
**TPH Analytical Results**  
**Sample Tt-SPBW-C4-S-0.5**

Carbon Chain	Detection (mg/kg)
C6	ND (<63)
C7	ND (<63)
C8	ND (<63)
C9-C10	200
C11-C12	780
C13-C14	2,700
C15-C16	4,100
C17-C18	9,400
C19-C20	5,500
C21-C22	3,600
C23-C24	4,700
C25-C28	1,800
C29-C32	4,900
C33-C36	4,100
C37-C40	2,400
C41-C44	1,500
C6-C44 Total	46,000

Notes:

mg/kg = milligrams per kilogram

ND = Non-detect

**Table 2**  
**2016 Soil Metal Analytical Results**  
**(mg/kg)**

Sample Date	Boring	Sample ID	Depth	Antimony	Arsenic	Copper	Lead	Zinc	Mercury
1/18/16	Tt-SPBW-B6	Tt-SPBW-B6-0.5	0.5		8.69	30.7			
1/18/16	Tt-SPBW-C8	Tt-SPBW-C8-0.5	0.5	1.72	11.5	697	28.7	186	4.75*
1/18/16	Tt-SPBW-D8	Tt-SPBW-D8-0.5	0.5		80.7	2,010		790	
		Tt-SPBW-D8-2.5	2.5			114		84.5	
1/18/16	Tt-SPBW-F5	Tt-SPBW-F5-0.5	0.5					127	
	Tt-SPBW-F5	Tt-SPBW-F5-2.5	2.5		14.9	31.5	17.5	205	0.386*
1/18/16	Tt-SPBW-F6	Tt-SPBW-F6-0.5	0.5		154	5,370	1,020	1,420	88.8*
	Tt-SPBW-F6	Tt-SPBW-F6-2.5	2.5		12.1	88.1	59.2	145	2.1*
1/18/16	Tt-SPBW-E5	Tt-SPBW-E5-0.5	0.5			38.2		53.5	
1/18/16	Tt-SPBW-F1	Tt-SPBW-F1-0.5	0.5		7.02	49.3		89.4	
	Tt-SPBW-F1	Tt-SPBW-F1-2.5	2.5		7.06	36.5		74.3	
	Tt-SPBW-F1	Tt-SPBW-F1-8	1-8			68.4	59.6		
1/18/16	Tt-SPBW-E3	Tt-SPBW-E3-0.5	0.5		121	2,220	1,520		
	Tt-SPBW-E3	Tt-SPBW-E3-2.5	2.5		15.8				
	Tt-SPBW-E3	Tt-SPBW-E3-5	3-5		10.8	275			
STLC (mg/L)				15	5	25	5	250	0.2
Screening Criteria (10X) STLC (mg/kg)				150	50	250	50	2,500	2
TTLC (mg/kg)				500	500	2,500	1,000	5,000	20
TCLP (mg/L)				-	5	-	5	-	0.2
Screening Criteria (20X) TCLP (mg/kg)				-	100	-	100	-	4

Notes:

mg/kg = milligrams per kilogram

STLC = Soluble Threshold Limit Concentration

TTLC = Total Threshold Limit Concentration

TCLP = Toxicity Characteristic Leaching Procedure

mg/L = milligrams per liter

**Bolded** = Exceeds TTLC criteria

**123 (Red)** = Exceeds TCLP or STLC screening criteria

\* = sample analyzed past holding time

**Table 3**  
**Comparison of 2014 Feasibility Study and 2017 Revised RAW Cleanup Goals**

Analytes	Cleanup Goals		Basis of Goal
	2014 SPBW FS	FINAL SPBW GOALS 2016	
	mg/kg	mg/kg	
Metals			
Antimony	30	30	Risk based
Arsenic	12.5	12	Cleanup goal at similar site within the Port of Los Angeles
Copper	51.5	51.5	Background threshold value
Lead	80	50	Ten times soluble threshold limit concentration (STLC) <sup>1</sup>
Mercury	23	0.69	Cleanup goal at similar site within the Port of Los Angeles
Zinc	99	99	Background threshold value
Polynuclear Aromatic Hydrocarbon (PAH)			
B(a)P Equivalent	0.24	0.24	UCL95 concentration in southern California soil <sup>2</sup>
Polychlorinated Biphenyl (PCB) <sup>3</sup>			
Aroclor-1248	0.22	0.22	Risk based for unrestricted use
Aroclor-1254	0.22	0.22	Risk based for unrestricted use
Aroclor-1260	0.22	0.22	Risk based for unrestricted use
Total PCBs	0.22	0.22	Risk based for unrestricted use
Total Petroleum Hydrocarbon (TPH)			
TPH Gasoline Range (C <sub>5</sub> -C <sub>9</sub> / C <sub>7</sub> -C <sub>12</sub> / C <sub>6</sub> -C <sub>12</sub> )	720	180	Cleanup goal at similar site within the Port of Los Angeles
TPH Diesel Range (C <sub>10</sub> -C <sub>25</sub> / C <sub>13</sub> -C <sub>22</sub> / C <sub>9</sub> -C <sub>25</sub> )	2,500	180	Cleanup goal at similar site within the Port of Los Angeles
TPH Motor Oil (C <sub>25</sub> -C <sub>36</sub> / C <sub>23</sub> -C <sub>36</sub> / C <sub>24</sub> -C <sub>40</sub> )	1,700	1,700	Risk based for unrestricted use

Notes:

<sup>1</sup> = Environmental Guidance for Industrial Use Soil, City of Los Angeles Harbor Department, Environmental Management Division (February 2016)

<sup>2</sup> = Use of the Northern and Southern California Polynuclear Aromatic Hydrocarbon (PAH) Studies in the Manufactured Gas Plant Site Cleanup Process. DTSC, July 2009.

<sup>3</sup> = PCB concentrations exceeding 1.1 mg/kg will be removed.

B(a)P = Benzo(a)pyrene

mg/kg = milligrams per kilogram

FS = Feasibility Study

Table 4  
Soil Removal Locations, Volume, and COCs

Soil Boring	Location	Chemicals of Concern	Excavation Group	Depth (ft bgs)	Surface Area (sq. ft.)	Volume (cu. ft)	Volume (CY)	Volume (tons) <sup>a</sup>
TtSPBW-8, TtSPBW-8A	Inside Machine Shop (north end)*	As, Cu, Pb, Hg, Zn	Shallow	6.5	38.65	251.23	9.30	15.82
TtSPBW-11	East of Office	As, Cu, Pb, Hg, Zn, BaP, PCBs, TPH	Surface	2	25.00	50.00	1.85	3.15
TtSPBW-3	Immediately north of Drum Storage	As, Cu, Pb, Hg, Zn, BaP, PCBs, TPH	Shallow	10	50.00	500.00	18.52	31.48
SPBW-RI-S2	North of Dry Material Storage	Cu, Pb	Deep	10	25.00	250.00	9.26	15.74
TtSPBW-7	North of Dry Material Storage	As, Cu, Pb, Hg, Zn, TPH	Shallow	4	25.00	100.00	3.70	6.30
TtSPBW-13	Inside Machine Shop (south end)*	Sb, As, Cu, Pb, Hg, Zn	Shallow	4	25.00	100.00	3.70	6.30
TtSPBW-E2	Southwest of Drum Storage	PCBs	Shallow	4	25.00	100.00	3.70	6.30
TtSPBW-17	South of Machine Shop / Septic Tank	As, Cu, Pb, Hg, Zn	Surface	2	25.00	50.00	1.85	3.15
TtSPBW-18	Northeast of Wooden Ramp	As, Cu, Pb, Hg, Zn	Shallow	4	25.00	100.00	3.70	6.30
Tt-SPBW-C4	Rail D of Turntable	PCBs	Surface	2	25.00	50.00	1.85	3.15
Tt-SPBW-C4-S	Rail D of Turntable	TPH	Surface	2	25.00	50.00	1.85	3.15
Tt-SPBW-E3	Rail F of Turntable	As, Cu, Pb, PCBs	Shallow	6.5	25.00	162.50	6.02	10.23
Tt-SPBW-E3-E	Rail F of Turntable	PCBs	Surface	2	25.00	50.00	1.85	3.15
TtSPBW-14	Near former transformer between rails E and F	As, Cu, Pb, Hg, Zn, BaP	Surface	2	75.00	150.00	5.56	9.44
SPBW-RI-S7	Between rails F and G	As, Cu, Pb, Hg, PCBs	Surface	2	150.00	300.00	11.11	18.89
TtSPBW-15, SPBW-RI-S6, TtSPBW-23	Between rails F and G	Sb, As, Cu, Pb, Hg, Zn, BaP, PCBs, TPH	Shallow	6.5	309.05	2,008.83	74.40	126.48
TtSPBW-19	Rail C of Turntable	As, Cu, Pb, Hg, Zn, TPH	Surface	4	25.00	100.00	3.70	6.30
TtSPBW-21	Between rails E and F	As, Cu, Pb, Hg, Zn, TPH	Surface	4	25.00	100.00	3.70	6.30
TtSPBW-26, TtSPBW-25, TtSPBW-25A	Turntable	As, Cu, Pb, Hg, Zn, BaP, PCBs, TPH, and 2,3,7,8-TCDD	Shallow	4	835.00	3,340.00	123.70	210.30
TtSPBW-27, SPBW-RI-S13	Turntable	As, Cu, Pb, Hg, Zn, BaP, PCBs	Surface	2	861.00	1,722.00	63.78	108.42
SPBW-RI-S10	Turntable	As, PCBs	Shallow	6.5	25.00	162.50	6.02	10.23
SPBW-RI-S12	Turntable	As, Cu, BaP, PCBs	Deep	9.5	25.00	237.50	8.80	14.95
TtSPBW-28	Northwest of former Winch House	As, Cu, Pb, Hg, Zn, BaP, PCBs, TPH	Shallow	4	25.00	100.00	3.70	6.30
TtSPBW-24	Between Paint Shop and former Paint Storage	As, Cu, Pb, Hg, Zn, BaP	Shallow	4	18.93	75.70	2.80	4.77
SPBW-RI-S14	Southwest of Turntable	As, PCBs	Surface	4	75.00	300.00	11.11	18.89
Tt-SBPW-34 and TtSPBW-35	Southwest of Turntable	Sb, As, Cu, Pb, Hg, Zn, BaP, PCBs	Surface	4	111.24	444.96	16.48	28.02
TtSPBW-29, TtSPBW-36	South of Turntable	As, Cu, Pb, Hg, Zn	Shallow	4	130.00	520.00	19.26	32.74
TtSPBW-30	West of former Winch House	As, Cu, Pb, Hg, Zn	Surface	2	25.00	50.00	1.85	3.15
SPBW-RI-S16	South of former Winch House	As, Pb, Hg	Deep	10	25.00	250.01	9.26	15.74
TtSPBW-38	South of former Winch House	Sb, As, Cu, Pb, Hg, Zn, BaP, PCBs	Surface	2	112.31	224.62	8.32	14.14
SPBW-RI-S19	Southwest of Concrete Ramp	As, Pb, Hg, BaP	Surface	2	25.00	50.00	1.85	3.15
Tt-SPBW-F6	On Concrete Ramp	As, Cu, Pb, Hg, Zn, PCBs	Shallow	4	25.00	100.00	3.70	6.30
TtSPBW-F6-S	Southwest of Concrete Ramp	PCBs	Surface	2	25.00	50.00	1.85	3.15
TtSPBW-31	Northeast of Concrete Ramp	As, Cu, Pb, Hg, Zn, BaP, PCBs	Surface	2	25.00	50.00	1.85	3.15
TtSPBW-53	Western edge between Fire House and Eqpmt Storage	Sb, As, Cu, Pb, Hg, Zn	Surface	2	25.00	50.00	1.85	3.15
Tt-SPBW-C8	Along Rail M of Turntable	Sb, As, Cu, Pb, Hg, Zn, PCBs	Surface	2	25.00	50.00	1.85	3.15
TtSPBW-39	Southwest of Concrete Ramp	As, Cu, Pb, Hg, Zn	Deep	8	25.00	200.00	7.41	12.59
TtSPBW-48	North of Equipment Storage	As, Cu, Pb, Hg, Zn	Surface	2	25.00	50.00	1.85	3.15
Tt-SPBW-D8	Along rail L of Turntable	As, Cu, Zn, PCBs	Shallow	4	25.00	100.00	3.70	6.30
SPBW-RI-S24	Northeast of Electrical Shop	As, Pb, Hg, PCBs	Shallow	6.5	25.00	162.50	6.02	10.23
TtSPBW-49	Between western fence and Equipment Storage*	As, Cu, Pb, Hg, Zn	Shallow	6.5	25.00	162.50	6.02	10.23
TtSPBW-45, TtSPBW-46	Northwest of Electrical Shop	As, Cu, Pb, Hg, Zn	Surface	4	175.00	700.00	25.93	44.07
TtSPBW-50	South of Equipment Storage	As, Cu, Pb, Hg, Zn	Shallow	6.5	25.00	162.50	6.02	10.23
Tt-SPBW-D9, SPBW-RI-S25	Along rail L of Turntable	PCBs	Surface	2	75.00	150.00	5.56	9.44
Tt-SPBW-D9-E	Along rail L of Turntable	PCBs	Surface	2	25.00	50.00	1.85	3.15
Tt-SPBW-E9	Southern exposed soil area	PCBs	Surface	2	25.00	50.00	1.85	3.15
Tt-SPBW-E9-N, SPBW-RI-S26	Southern exposed soil area	PCBs	Surface	6.5	50.00	325.00	12.04	20.46
TtSPBW-47	East of Electrical Shop	As, Cu, Pb, Hg, Zn	Surface	4	25.00	100.00	3.70	6.30
Tt-SPBW-47-N	East of Electrical Shop	PCBs	Surface	4	25.00	100.00	3.70	6.30
Tt-SPBW-47-S	East of Electrical Shop	PCBs	Surface	4	25.00	100.00	3.70	6.30
SPBW-RI-S28, SPBW-RI-S27	Southern exposed soil area	PCBs	Shallow	6.5	347.09	2,256.09	83.56	142.05
TtSPBW-52, TtSPBW-AS3-S, TtSPBW-AS3-SE	Southern exposed soil area	As, Cu, Pb, Zn, PCBs	Surface	4	322.59	1,290.35	47.79	81.24
				Total	4,610.85	18,208.77	674.40	1,146.48

Notes:

Certain locations are grouped based on their proximity to each other and removal depths.

ft bgs = feet below ground surface

sq. ft. = square feet

cu. ft. = cubic feet

CY = cubic yard

<sup>a</sup> = weight is based on an esitmated bulk density of 1.7 tons/CY

\* = Removals of these areas will be completed after the building has been demolished.

Surface = excavations to 2 or 4 ft bgs

Shallow = excavations to 6.5 ft bgs

Deep = excavations to 9.5 to 10 ft bgs

**Table 5**  
**RME Calculations and RAW Cleanup Goals**

Chemical of Concern	Total Number of Samples	Total Number of Detections	Percent Detected (%)	Minimum Detected Value	Maximum Detected Value	UCL Equation	Recommended UCL (No Removals)	RME	RAW Cleanup Goals
Antimony	84	1	1.19	0.773	0.773	too few detects	-	0.773	30
Arsenic	144	144	100	1.99	20	95% Student's-t UCL	10.74	10.74	12
Copper	103	103	100	13	95.4	95% Student's-t UCL	50.71	50.71	51.5
Lead	141	141	100	2.65	135	95% Chebyshev (Mean, Sd) UCL	18.07	18.07	50
Mercury	134	122	91.04	0.0175	5.37	95% KM (BCA) UCL	0.34	0.341	0.69
Zinc	67	67	100	42	205	95% Student's-t UCL	89.78	89.78	99
B(a)P Equivalent-8270	6	6	100	0.3250	0.325	One Distinct Observation	-	0.325	0.24
B(a)P Equivalent-8310	25	25	100	0.0031	0.165	95% Chebyshev (Mean, Sd) UCL	0.0655	0.0655	0.24
Aroclor-1248	157	10	6.369	0.02	0.58	95% KM (t) UCL	0.043	0.043	0.22
Aroclor-1254	157	12	7.643	0.019	0.97	95% KM (t) UCL	0.059	0.059	0.22
Aroclor-1260	157	5	3.185	0.046	0.12	95% KM (t) UCL	0.0505	0.0505	0.22
Total PCBs	157	16	10.19	0.069	1.02	95% KM (t) UCL	0.118	0.118	0.22
TPH Diesel (C <sub>13</sub> -C <sub>22</sub> )	106	106	100	1.63	1,230	95% Chebyshev (Mean, Sd) UCL	158	158	180
TPH Gasoline (C <sub>7</sub> -C <sub>12</sub> )	106	85	80.19	4.649	157	95% KM (BCA) UCL	18.92	18.92	180
TPH Residual (C <sub>23</sub> -C <sub>36</sub> )	106	106	100	1.36	930	95% Chebyshev (Mean, Sd) UCL	162.4	162.4	1,700

**Notes:**

All units are in mg/kg for soil (0-10 ft)

B(a)P = Benzo(a)pyrene

mg/kg = milligrams per kilogram

RME = reasonable maximum exposure

UCL = upper confidence limit

% = percent

**Table 6-1**  
**Post-Remediation Risk Evaluation for Commercial/Industrial Workers**  
**(Soil, 0-2 feet bgs)**

Chemical	RME <sup>1</sup> (mg/kg)	Commercial/Industrial Soil Screening Level <sup>2</sup>		Estimated Cancer Risk <sup>3</sup>	Estimated Hazard Quotient <sup>4</sup>
		Cancer (mg/kg)	Noncancer (mg/kg)		
PAHs					
B(a)P Equivalent <sup>5</sup>	0.044	0.88	----	5.0E-07	----
Metals					
Arsenic	11	16	256	7.1E-06	4.4E-02
Copper	58	----	36,697	----	1.6E-03
Lead	33	----	----	----	----
Mercury	1.0	----	275	----	3.7E-03
Zinc	95	----	275,224	----	3.4E-04
PCBs					
Aroclor-1248	0.085	5.5	7.9	1.5E-07	1.1E-02
Aroclor-1254	0.098	5.5	7.9	1.8E-07	1.2E-02
Aroclor-1260	0.052	5.5	7.9	9.4E-08	6.6E-03
TPHs					
TPH Gasoline (C7-C12)	16	----	5,900	----	2.6E-03
TPH Diesel (C13-C22)	189	----	19,000	----	1.0E-02
TPH Motor Oil (C23-C36)	378	----	12,000	----	3.2E-02
Total Estimated Cumulative Risk and Hazard Index <sup>6</sup>				8.E-06	0.1
Risks/Hazards attributable to background <sup>7</sup>				<u>8.E-06</u>	<u>0.04</u>
Estimated Site-Related Cumulative Risk and Hazard Index <sup>8</sup>				4.E-07	0.08

**Notes:**

- 1 - Based on measurements within the 0-2 ft depth interval.
- 2 - Protective of dermal contact, ingestion, dust inhalation, and outdoor vapor inhalation pathways. Cancer screening level is based on a target risk of  $1 \times 10^{-5}$ .
- 3 - Estimated cancer risk = (RME concentration/cancer soil screening level)  $\times 10^{-5}$ .
- 4 - Estimated hazard quotient = (RME concentration/non-cancer soil screening level).
- 5 - The PAHs were analyzed via multiple lab methods (Method 8270 and 8310); the RME shown above is from Method 8310, which is the PAH-specific method.
- 6 - Cumulative risk and hazard index represent the sum of chemical-specific cancer risks and hazard quotients, respectively.
- 7 - Risk and hazard attributable to background is associated with B(a)P-equivalents and arsenic.
- 8 - Site-related risk/hazard equals total estimated risk or hazard minus site-related risk and hazard.

mg/kg = milligrams per kilogram

PAH = Polycyclic aromatic hydrocarbon

PCB = Polychlorinated biphenyls

TPH = Total petroleum hydrocarbons

**Table 6-2**  
**Post-Remediation Risk Evaluation for Commercial/Industrial Workers**  
**(Soil, 0-10 feet bgs)**

Chemical	RME <sup>1</sup> (mg/kg)	Commercial/Industrial Soil Screening Level <sup>2</sup>		Estimated Cancer Risk <sup>3</sup>	Estimated Hazard Quotient <sup>4</sup>
		Cancer (mg/kg)	Noncancer (mg/kg)		
PAHs					
B(a)P Equivalent <sup>5</sup>	0.066	0.88	----	7.4E-07	----
Metals					
Antimony	0.77	----	367	----	2.1E-03
Arsenic	11	16	256	6.7E-06	4.2E-02
Copper	51	----	36,697	----	1.4E-03
Lead	18	----	----	----	----
Mercury	0.34	----	275	----	1.2E-03
Zinc	90	----	275,224	----	3.3E-04
PCBs					
Aroclor-1248	0.043	5.5	7.9	7.7E-08	5.4E-03
Aroclor-1254	0.059	5.5	7.9	1.1E-07	7.5E-03
Aroclor-1260	0.051	5.5	7.9	9.2E-08	6.4E-03
TPHs					
TPH Gasoline (C7-C12)	19	----	5,900	----	3.2E-03
TPH Diesel (C13-C22)	158	----	19,000	----	8.3E-03
TPH Motor Oil (C23-C36)	162	----	12,000	----	1.4E-02
Total Estimated Cumulative Risk and Hazard Index <sup>6</sup>				8.E-06	0.09
Risks/Hazards attributable to background <sup>7</sup>				<u>7.E-06</u>	<u>0.04</u>
Estimated Site-Related Cumulative Risk and Hazard Index <sup>8</sup>				3.E-07	0.05

**Notes:**

- 1 - Based on measurements within the 0-10 ft depth interval.
- 2 - Protective of dermal contact, ingestion, dust inhalation, and outdoor vapor inhalation pathways. Cancer screening level is based on a target risk of  $1 \times 10^{-5}$ .
- 3 - Estimated cancer risk = (RME concentration/cancer soil screening level)  $\times 10^{-5}$ .
- 4 - Estimated hazard quotient = (RME concentration/non-cancer soil screening level).
- 5 - The PAHs were analyzed via multiple lab methods (Method 8270 and 8310); the RME shown above is from Method 8310, which is the PAH-specific method.
- 6 - Cumulative risk and hazard index represent the sum of chemical-specific cancer risks and hazard quotients, respectively.
- 7 - Risk and hazard attributable to background is associated with B(a)P-equivalents and arsenic.
- 8 - Site-related risk/hazard equals total estimated risk or hazard minus site-related risk and hazard.

mg/kg = milligrams per kilogram

PAH = Polycyclic aromatic hydrocarbon

PCB = Polychlorinated biphenyls

TPH = Total petroleum hydrocarbons



**Table 6-3**  
**Post-Remediation Risk Evaluation for Construction Workers**  
**(Soil, 0-2 feet bgs)**

Chemical	RME <sup>1</sup>  (mg/kg)	Construction Worker Soil Screening Level <sup>2</sup>		Estimated Cancer Risk <sup>3</sup>	Estimated Hazard Quotient <sup>4</sup>
		Cancer (mg/kg)	Noncancer (mg/kg)		
PAHs					
B(a)P Equivalent <sup>5</sup>	0.044	5.9	----	7.5E-08	----
Metals					
Arsenic	11	92	33	1.2E-06	3.4E-01
Copper	58	----	10,694	----	5.5E-03
Lead	33	----	----	----	----
Mercury	1.0	----	50	----	2.0E-02
Zinc	95	----	80,206	----	1.2E-03
PCBs					
Aroclor-1248	0.085	37	2.1	2.3E-08	4.0E-02
Aroclor-1254	0.098	37	2.1	2.7E-08	4.7E-02
Aroclor-1260	0.052	37	2.1	1.4E-08	2.4E-02
TPHs					
TPH Gasoline (C7-C12)	16	----	1,400	----	1.1E-02
TPH Diesel (C13-C22)	189	----	4,900	----	3.9E-02
TPH Motor Oil (C23-C36)	378	----	3,300	----	1.1E-01
Total Estimated Cumulative Risk and Hazard Index <sup>6</sup>				1.E-06	0.6
Risks/Hazards attributable to background <sup>7</sup>				<u>1.E-06</u>	<u>0.3</u>
Estimated Site-Related Cumulative Risk and Hazard Index <sup>8</sup>				6.E-08	0.3

**Notes:**

- 1 - Based on measurements within the 0-2 ft depth interval.
- 2 - Protective of dermal contact, ingestion, dust inhalation, and outdoor vapor inhalation pathways. Cancer screening level is based on a target risk of  $1 \times 10^{-5}$ .
- 3 - Estimated cancer risk = (RME concentration/cancer soil screening level)  $\times 10^{-5}$ .
- 4 - Estimated hazard quotient = (RME concentration/non-cancer soil screening level).
- 5 - The PAHs were analyzed via multiple lab methods (Method 8270 and 8310); the RME shown above is from Method 8310, which is the PAH-specific method.
- 6 - Cumulative risk and hazard index represent the sum of chemical-specific cancer risks and hazard quotients, respectively.
- 7 - Risk and hazard attributable to background is associated with B(a)P-equivalents and arsenic.
- 8 - Site-related risk/hazard equals total estimated risk or hazard minus site-related risk and hazard.

mg/kg = milligrams per kilogram

PAH = Polycyclic aromatic hydrocarbon

PCB = Polychlorinated biphenyls

TPH = Total petroleum hydrocarbons

**Table 6-4**  
**Post-Remediation Risk Evaluation for Construction Workers**  
**(Soil, 0-10 feet bgs)**

Chemical	RME <sup>1</sup> (mg/kg)	Construction Worker Soil Screening Level <sup>2</sup>		Estimated Cancer Risk <sup>3</sup>	Estimated Hazard Quotient <sup>4</sup>
		Cancer (mg/kg)	Noncancer (mg/kg)		
PAHs					
B(a)P Equivalent <sup>5</sup>	0.066	5.9	----	1.1E-07	----
Metals					
Antimony	0.773	----	107	----	7.2E-03
Arsenic	11	92	33	1.2E-06	3.3E-01
Copper	51	----	10,694	----	4.7E-03
Lead	18	----	----	----	----
Mercury	0.34	----	50	----	6.8E-03
Zinc	90	----	80,206	----	1.1E-03
PCBs					
Aroclor-1248	0.043	37	2.1	1.2E-08	2.0E-02
Aroclor-1254	0.059	37	2.1	1.6E-08	2.8E-02
Aroclor-1260	0.051	37	2.1	1.4E-08	2.4E-02
TPHs					
TPH Gasoline (C7-C12)	19	----	1,400	----	1.4E-02
TPH Diesel (C13-C22)	158	----	4,900	----	3.2E-02
TPH Motor Oil (C23-C36)	162	----	3,300	----	4.9E-02
Cumulative Risk lative Risk and Hazard Index <sup>6</sup>				1.E-06	0.5
Risks/Hazards attributable to background <sup>7</sup>				<u>1.E-06</u>	<u>0.3</u>
Hazard Index <sup>6</sup> lative Risk and Hazard Index <sup>8</sup>				4.E-08	0.2

**Notes:**

- 1 - Based on measurements within the 0-10 ft depth interval.
- 2 - Protective of dermal contact, ingestion, dust inhalation, and outdoor vapor inhalation pathways. Cancer screening level is based on a target risk of  $1 \times 10^{-5}$ .
- 3 - Estimated cancer risk = (RME concentration/cancer soil screening level)  $\times 10^{-5}$ .
- 4 - Estimated hazard quotient = (RME concentration/non-cancer soil screening level).
- 5 - The PAHs were analyzed via multiple lab methods (Method 8270 and 8310); the RME shown above is from Method 8310, which is the PAH-specific method.
- 6 - Cumulative risk and hazard index represent the sum of chemical-specific cancer risks and hazard quotients, respectively.
- 7 - Risk and hazard attributable to background is associated with B(a)P-equivalents and arsenic.
- 8 - Site-related risk/hazard equals total estimated risk or hazard minus site-related risk and hazard.

mg/kg = milligrams per kilogram

PAH = Polycyclic aromatic hydrocarbon

PCB = Polychlorinated biphenyls

TPH = Total petroleum hydrocarbons

**Table 6-5**  
**Post-Remediation Risk Evaluation for Future Residents**  
**(Soil, 0-10 feet bgs)**

Chemical	RME <sup>1</sup>  (mg/kg)	Future Resident Soil Screening Level <sup>2</sup>		Estimated Cancer Risk <sup>3</sup>	Estimated Hazard Quotient <sup>4</sup>
		Cancer (mg/kg)	Noncancer (mg/kg)		
PAHs					
B(a)P Equivalent <sup>5</sup>	0.066	0.036	----	1.8E-06	----
Metals					
Antimony	0.77	----	30	----	2.5E-02
Arsenic	10.7	0.39	22	2.8E-05	5.0E-01
Copper	51	----	3,040	----	1.7E-02
Lead	18	----	----	----	----
Mercury	0.34	----	23	----	1.5E-02
Zinc	90	----	22,803	----	3.9E-03
PCBs					
Aroclor-1248	0.043	0.22	1.1	1.9E-07	3.8E-02
Aroclor-1254	0.059	0.22	1.1	2.7E-07	5.3E-02
Aroclor-1260	0.051	0.22	1.1	2.3E-07	4.5E-02
TPHs					
TPH Gasoline (C7-C12)	19	----	720	----	2.6E-02
TPH Diesel (C13-C22)	158	----	2,500	----	6.3E-02
TPH Motor Oil (C23-C36)	162	----	1,700	----	9.6E-02
Total Estimated Cumulative Risk and Hazard Index <sup>6</sup>				3.E-05	0.9
Risks/Hazards attributable to background <sup>7</sup>				<u>3.E-05</u>	<u>5.0E-01</u>
Estimated Site-Related Cumulative Risk and Hazard Index <sup>8</sup>				7.E-07	0.4

**Notes:**

- 1 - Based on measurements within the 0-10 ft depth interval.
- 2 - Protective of dermal contact, ingestion, dust inhalation, and outdoor vapor inhalation pathways. Cancer screening level is based on a target risk of  $1 \times 10^{-6}$ .
- 3 - Estimated cancer risk = (RME concentration/cancer soil screening level)  $\times 10^{-6}$ .
- 4 - Estimated hazard quotient = (RME concentration/non-cancer soil screening level).
- 5 - The PAHs were analyzed via multiple lab methods (Method 8270 and 8310); the RME shown above is from Method 8310, which is the PAH-specific method.
- 6 - Cumulative risk and hazard index represent the sum of chemical-specific cancer risks and hazard quotients, respectively.
- 7 - Risk and hazard attributable to background is associated with B(a)P-equivalents and arsenic.
- 8 - Site-related risk/hazard equals total estimated risk or hazard minus site-related risk and hazard.

mg/kg = milligrams per kilogram

PAH = Polycyclic aromatic hydrocarbon

PCB = Polychlorinated biphenyls

TPH = Total petroleum hydrocarbons

**Table 7**  
**Applicable or Relevant and Appropriate Requirements**

Requirement	Description	ARAC or TBC
Resource Conservation and Recovery Act, as amended by the Hazardous and Solid Waste Amendments (40 CFR 260 to 299, 42 USC 7401-7642)	Federal act that classifies and regulates hazardous waste and facilities that treat, store and dispose of hazardous waste.	Applicable. Potential hazardous materials would be generated from soil removal and would need to be disposed of.
Toxic Substances Control Act, 15 USC 2601 et seq. 40 CFR 761.60 (PCB Spill Cleanup Policy)	The PCB Spill Cleanup Policy establishes specific, numerical cleanup goals for soils and surfaces based on: location, the potential for exposure, the concentration of PCBs initially spilled, and the nature and size of the populations potentially exposed. For nonrestricted access sites (residential/commercial areas and unrestricted access rural areas) the standard for soil is 10 parts per million (ppm) PCB by weight provided that the soil is excavated to a minimum depth of 10 inches and a 10-inch cap of clean soil (containing less than 1 ppm PCBs) is put on the site as part of restoration activities. The policy also establishes a category for spills at sites warranting additional cleanup. This section does not establish a numerical goal but the narrative goal indicates that EPA may establish stricter cleanup goals if site-specific risk factors warrant additional cleanup.	Applicable. The COPCs include PCB.
California Environmental Quality Act (CEQA) (CCR Title 14 Sections	Requires evaluation of the removal action for environmental impacts	Applicable. Remediation would be evaluated for environmental impacts.
California Hazardous Waste Control Act (HSC, Chapter 6.5, section 25100 et seq., 22 CCR 66260.1 et seq.)	Establishes criteria for determining waste classification for the purposes of transportation and land disposal of wastes in California. Regulates treatment, storage, transportation and disposal of substances identified as hazardous.	Applicable. Potential hazardous materials would be generated from soil removal and would need to be disposed of.
Hazardous Waste Generator Requirements (22 CCR 66262.1 et seq.)	Establishes standards applicable to generators of hazardous waste.	Applicable. Potential hazardous materials would be generated from soil removal and would need to be disposed of.
Land Disposal Restrictions (22 CCR 66268.7 et seq.)	Establishes standards for treatment and land disposal of hazardous waste.	Applicable. Potential hazardous materials would be generated from soil removal and would need to be disposed of.
Stockpiling Requirements for Contaminated Soil (California Health and Safety Code [HSC] Section 25123.3(a)(2)	Establishes standards for stockpiling of non-RCRA contaminated soil	Applicable. Contaminated soil will be stockpiled.
California Hazardous Substances Account Act (HSC section 25340-25392)	Establishes fees regarding disposal of hazardous substances and outlines process for cleanup of hazardous substance release sites.	Applicable. Potential hazardous materials would be generated from soil removal and would need to be disposed of.
Hazardous Waste Haulers Act (22 CCR Chapter 30)	Governs transportation of hazardous materials in California.	Applicable. Potential hazardous materials would be transported along designated highways.
Hazardous Material Transportation Act (40 CFR 107 and 171-177)	Establishes packaging, placarding, labeling, driver training and record keeping requirements for transport of hazardous materials along public roads.	Applicable. Potential hazardous materials would be transported along designated highways.
California Hazardous Waste Control Act (22 CCR 66268.40)	A waste identified in the table “Treatment Standards for Hazardous Waste” may be land disposed only if it meets the requirements for waste concentrations found in the table.	Applicable. Potential hazardous materials would be generated from soil removal and would need to be disposed of.
SCAQMD Rules and Regulations a. Regulation II-Permits Rule 403 - Fugitive Dust	Limits on site activities so that the concentration of fugitive dust at the property line shall not be visible downwind and particulate concentration shall not exceed 100 micrograms per cubic meter averaging over 5 hours, at a wind speed above 15 miles per hour. The rule also requires every reasonable precaution to minimize fugitive dust and the prevention and cleanup of any material accidentally deposited on paved streets.	Applicable. Potential hazardous materials (in dust) would be generated from soil removal and would need to be mitigated.
Occupational Safety and Health (OSHA) Act (29 CFR 1910.120 et seq.)	Identifies permissible exposure limits (PELs) for inhalation or dermal exposure of workers to chemicals. When PELs are exceeded, OSHA requires the use of personal protective equipment (PPE) or other methods to block exposure.	Identifies permissible exposure limits (PELs) for inhalation or dermal exposure of workers to chemicals. When PELs are exceeded, OSHA requires the use of PPE or other methods to block exposure.

Notes:  
CCR = California Code of Regulations  
CFR = Code of Federal Regulations  
HSC = Health and Safety Code  
USC = United States Code  
PCBs = polychlorinated biphenyls

**Table 8**  
**Estimated Remediation Costs**

No.	TASK	UNRESTRICTED LAND USE			
		No.	Units	Unit Cost	Subtotal
1	USEPA Notification, HASP, WMP, QAPP	1	LS	\$59,662	\$59,662
2	Excavation and Offsite Disposal of Contaminated Soil				
	Preconstruction and Mobilization Activities	1	LS	\$8,925	\$8,925
	Hardscape Removal Activities (est. 3,000 sq. ft. of concrete)	1	LS	\$23,625	\$23,625
	Transport and disposal of concrete/asphalt	4	load	\$473	\$1,890
	Transport and disposal of steel rail	1	load	\$1,575	\$1,575
	Transport and disposal of railroad ties, Class III	1	load	\$2,363	\$2,363
	Excavate soil and stockpile, includes cost of breaking and stockpiling asphalt/pavement	5	day	\$6,825	\$34,125
	Backfill and Compaction Activities	3	day	\$6,458	\$19,373
	Compaction Report	1	LS	\$2,625	\$2,625
	Load, transport, and disposal of non-hazardous soil, Class III	234	ton	\$95	\$22,091
	Load, transport, and disposal of non-RCRA hazardous soil	360	ton	\$223	\$80,098
	Containerize, load, transport, and disposal of RCRA hazardous, including TSCA	664	ton	\$336	\$223,241
	Clean Import Fill	1,635	ton	\$28	\$46,364
	Demobilization and Project Documentation	1	LS	\$6,510	\$6,510
3	Limited Area Excavation: Excavate areas Adjacent to Equipment Storage and Paint Shop and within the Machine Shop <sup>1</sup>				
	Sawcut and excavate areas adjacent to and within existing buildings	2	day	\$8,000	\$16,000
	Backfill and compaction of areas adjacent to and inside of the	2	day	\$5,500	\$11,000
	Load, transport, and disposal of non-hazardous soil (includes \$400 loading cost)	38	tons	\$95	\$3,991
4	Excavation Confirmation Sampling and Statistical Analyses				
	Statistical Analyses	1	LS	\$49,929	\$49,929
	Confirmation Sample Laboratory Analyses	535	samples	Varies*	\$116,572
	Soil Stockpile Sampling	6	sample	\$339	\$2,033
5	Excavation Report	1	LS	\$52,610	\$52,610
<b>Subtotal</b>					<b>\$784,601</b>
Contingency at 25%					\$196,150
<b>Total Estimated Costs</b>					<b>\$980,751</b>

**Notes:**

These costs do not include Demolition of the buildings and abatement/sampling activities prior to demolition (Asbestos, Lead-based Paint, or PCBs). These costs assume Environmental Management Division will conduct the work and exclude costs to prepare bid specifications and drawings.

\* = analyses are based on COCs that exceed their respective cleanup goals

<sup>1</sup> = Separate costs for excavation of the locations located adjacent to buildings (TtSPBW-24, TtSPBW-49) and within the Machine Shop (TtSPBW-13, TtSPBW-8A) since the buildings most likely will be demolished after excavation activities.

USEPA = United States Environmental Protection Agency

HASP = Health and Safety Plan

WMP = Waste Management Plan

QAPP = Quality Assurance Project Plan

LS = lump sum

sq. ft. = square feet

TSCA = Toxic Substances Control Act

PCBs = polychlorinated biphenyls

**APPENDIX A**  
Quality Assurance Project Plan

# **QUALITY ASSURANCE PROJECT PLAN**

**FOR**

**FORMER SAN PEDRO BOAT WORKS  
MINER STREET, BERTH 44  
SAN PEDRO, CALIFORNIA**

**FEBUARY 2017**

**ADP# 920130-503**

**TC43245.23**

**PREPARED BY:**

Tetra Tech, Inc.  
3475 East Foothill Blvd.  
Pasadena, California 91107

**PREPARED FOR:**

City of Los Angeles Harbor Department  
Environmental Management Division  
425 S. Palos Verdes Street  
San Pedro, CA 90731

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**LIST OF ABBREVIATIONS AND ACRONYMS**

B(a)P	benzo(a)pyrene
bgs	below ground surface
CFR	Code of Federal Regulations
COC	compounds of concern
DQO	data quality objective
DTSC	Department of Toxic Substances Control
EB	equipment blank
EMD	Environmental Management Division
LACFD	Los Angeles County Fire Department
LCS	laboratory control samples
LIMS	Laboratory Information Management System
MB	method blank
MDL	method detection limit
MS/MSD	matrix spike/matrix spike duplicate
NIST	National Institute of Standards and Technology
OSHA	Occupational Safety and Health Administration
PAH	polynuclear aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, comparability, and completeness
PCBs	polychlorinated biphenyls
PM	project manager
POC	point of contact
POLA	Port of Los Angeles
PQL	practical quantitation limit
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RAW	Removal Action Workplan
RPD	relative percent difference
TCDD	2,3,7,8-tetrachlorodibenzodioxin
TB	temperature blank
TPH	total petroleum hydrocarbons
USEPA	United States Environmental Protection Agency

# SECTION 1

## INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared by Tetra Tech, Inc. (Tetra Tech) on behalf of the City of Los Angeles Harbor Department (Harbor Department) Environmental Management Division (EMD) to address quality assurance and quality control (QA/QC) policies associated with the collection of environmental data at the former San Pedro Boat Works (SPBW or the “Site”) located at Berths 43 and 44 in the Port of Los Angeles, San Pedro, California. This QAPP is Appendix A of the Revised Removal Action Workplan (RAW) (Tetra Tech, 2017). The purpose of this QAPP is to identify the methods of establishing technical accuracy, precision, and validity of data generated at the Site.

This QAPP provides additional information and guidelines for field sampling, laboratory, and analytical procedures to be implemented as part of the Revised RAW. It provides field and laboratory personnel with instructions regarding activities to be performed before, during, and after Revised RAW implementation. These instructions will ensure that data collected for use in project decisions will be of the type and quality needed and expected for their intended purpose.

Guidelines followed in the preparation of this QAPP are described in United States Environmental Protection Agency (USEPA) Requirements for Quality Assurance Project Plans, EPA QA/R-5 (USEPA, 2002) and USEPA Guidance for Quality Assurance Project Plans, EPA QA/G-5 (EPA, 2002). Other documents that have been referenced in this plan include Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4 (USEPA, 2006) and Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (USEPA, 2008).

### 1.1 SITE LOCATION

The former SPBW is located at Berth 44 of the Port of Los Angeles (POLA) at the southern end of Miner Street in San Pedro, California. The Site is approximately 3 acres in size and is bound to the north by Miner Street and the Cabrillo Marina, to the east by Berth 46 (asphalt covered open lot), and to the south and west by the Los Angeles Harbor. The topography of the Site is relatively flat and the elevation is generally less than 13.3 feet above mean lower low water (MLLW) (less than 16 feet above mean sea level).

### 1.2 CURRENT OPERATIONS

The Site is currently vacant with the majority of the former buildings still in place. Potentially historical buildings are located at the Site and the Harbor Department is currently in the process of evaluating their significance. The buildings will most likely remain onsite prior to remediation activities.

### 1.3 HISTORICAL USE

Since the 1920s, Berth 44 was operated as a commercial boat yard by various entities and by SPBW since 1932. The Site consists of 3.07 acres of land and 1.13 acres of water properties. The Site was used primarily for refurbishing commercial, private, and government vessels and contained a marine railway haul and launch system, supported by a 25-slip turntable yard, as well as buildings used for carpentry, welding, machining, and fiberglass work. Other services provided at the Site included sandblasting, painting, and electrical repairs. SPBW abandoned the facility in late November 2002 and filed for bankruptcy on December 13, 2002. The Bankruptcy Court returned ‘access control’ of the facility to the Harbor Department on June 10, 2003. In September 2003, the Harbor Department conducted a hazardous waste removal that transported and disposed of 1,500 tons of non-hazardous spent sandblast waste, 127 lab-

packed drums, 69 compressed gas cylinders, 11 car/marine batteries, and contaminated empty containers, under the enforcement action of LA County Fire Department (LACFD).

## 1.4 OBJECTIVES AND SCOPE

This QAPP has been developed to ensure that the type, quality, and quantity of analytical data obtained during the Revised RAW are sufficient to support the objectives. This QAPP contains a discussion of the QA/QC measures to be taken in relation to the following proposed investigation activities:

- Data quality objectives (DQOs) for the investigation
- Sample collection
- Sample custody
- Analytical procedures
- Data quality management
- Data quality oversight

## 1.5 ANALYTICAL SCOPE

The Revised RAW activities include sampling and analysis of subsurface soils for individual metals: antimony, arsenic, copper, lead, mercury, and zinc, polychlorinated biphenyl (PCBs), total petroleum hydrocarbons (TPH) gasoline, diesel, and motor oil ranges, and polycyclic aromatic hydrocarbons (PAHs). A detailed description of this investigation is provided in the Revised RAW and includes the specific locations, numbers of samples to be collected, and analyses assigned for each location. Environmental samples will be collected in accordance with methods presented in the Revised RAW. Analytical methods to be used are listed below.

- Antimony, arsenic, copper, lead, and zinc by USEPA Method 6010B
- Mercury by USEPA Method 7147A
- PAHs by USEPA Method 8310
- PCBs by USEPA Method 8082 with soxhlet extraction by USEPA Method 3540C
- TPH-gasoline carbon chain range (C6-C12) by USEPA Method 8015B with sample collection Method 5035
- TPH-diesel carbon chain range (C9-C25) by USEPA Method 8015B
- TPH-motor oil carbon chain range (C24-C40) by USEPA Method 8015B
- Dioxins and furans as 2,3,7,8-tetrachlorodibenzodioxin (TCDD) equivalent by USEPA Method 8280A

The selected environmental laboratory(s) will be certified under the Environmental Laboratory Accreditation Program (ELAP) in the State of California. Once the environmental laboratory(s) is selected, this QAPP will be revised to include their laboratory documentation.

## 1.6 DATA USE

The data collected as part of the implementation of the Revised RAW are intended to meet federal, state, and local data quality requirements so they can be used to confirm removal of soils exceeding the Site cleanup goals. The data will be used to meet the objectives of the Revised RAW by providing data sufficient to support the decision making.

## **1.7 PROJECT ORGANIZATION**

The following section describes the responsibilities of the key personnel who will be completing this project. The organization, functional responsibilities of key staff, and levels of authority among key participants are described below.

The program organization includes open lines of communications between all functional roles. Open lines of communication will facilitate quick identification and communication of relevant issues to appropriate parties, so that appropriate personnel may address the issue without undue delay. EMD will contract with an environmental consultant/contractor to implement the Revised RAW. As technical issues arise, the environmental consultant/contractor (EC) project manager (PM) shall be kept informed by all laboratory and field personnel so that they may identify appropriate personnel to consult with during the decision making process. The analytical laboratory(s) must contact the EC PM as soon as technical problems arise which cannot be solved at the laboratory level. The EC will work with the laboratory to resolve technical problems related to data quality and will include EMD's PM, as appropriate.

### **DTSC Point of Contact (POC)**

The DTSC PM is the designated environmental agency point-of-contact (POC) for the project. The DTSC POC will be involved in the upfront approval of the Revised RAW. The DTSC POC will provide information to the DTSC public participation specialist for disseminating information to the public.

### **EMD Project Manager**

The EMD PM is the designated POC for the project. The EMD PM reviews, approves, and submits all required documents to DTSC, notifies the DTSC POC at least 10 days prior to implementation of field activities, coordinates with Harbor Department personnel, and provides Site-specific assistance to EMD's EC, including facility access.

### **Environmental Consultant/Contractor Project Manager**

The EMD's EC PM for the Revised RAW implementation is responsible for overall project management for the direction, supervision, and coordination of all activities under the Revised RAW as well as EMD communication/interaction. The EC PM is also responsible for the day-to-day technical management of the project and for ensuring that appropriate resources and project personnel are available to implement the requirements set forth in this plan.

### **QA/QC Project Manager**

The EC QA/QC PM is responsible for the overall development of QA/QC for all fieldwork encompassing this program and reports any potential issues immediately to the EC PM. The QA/QC PM will oversee all field activities and review deliverables containing validated data.

## SECTION 2

# DATA QUALITY OBJECTIVES

The sufficient type, quality, and quantity of data to be collected that can meet revised RAW objectives are defined in the data quality objectives (DQOs) described below.

### 2.1 SUMMARY OF DATA QUALITY OBJECTIVES REQUIREMENTS

The DQO process specifies that a structured approach to planning a data collection activity be taken so that data obtained will be the type, quality, and quantity required to make a specific decision (USEPA, 2006). The seven-step DQO process begins with a clear definition of the decision on why the data are being collected. The DQO process then establishes the requirements of the sampling and analytical protocols for producing the required type, quality, and quantity of data.

### 2.2 DEFINITION OF DATA QUALITY OBJECTIVES FOR THE REVISED RAW

Based on the objectives of the Revised RAW, the DQOs for the Revised RAW can be defined by assigning target values to the following data quality indicators:

- Reporting detection limits
- Analytical documentation and data review
- Precision, Accuracy, Representativeness, Comparability, and Completeness (PARCC) Criteria

Each data quality indicator and its target values are described below. Quantitative values are assigned to the data quality indicators when possible.

#### 2.2.1 DETECTION LIMIT REQUIREMENTS

Laboratory analyses will be limited to the site specific compounds of concern. The laboratory method detection limits (MDLs) shall be sufficient detection limits to meet the Revised RAW objectives (e.g., for calculation of the reasonable maximum exposure (RME) concentrations to confirm soil removals). A detailed description of the analytical procedures and requirements for detection limits and quantitation data are provided in *Section 5.1* of this QAPP.

#### 2.2.2 ANALYTICAL DOCUMENTATION AND DATA REVIEW REQUIREMENTS

Sufficient documentation and data review is required to authenticate and verify the quality of the sample analyses results. Sample logs and QC summaries will be provided to EC for data review along with the sample laboratory analytical data. Analytical data will be validated as described in *Section 6.2* of this QAPP.

#### 2.2.3 PARCC CRITERIA

PARCC are qualitative and quantitative indicators of data quality. PARCC are defined as follows (USEPA, 2000):

- Precision: A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Usually expressed in terms of the relative percent difference (RPD) or standard deviation of the RPD.

- Accuracy: The degree of agreement of a measurement with an accepted reference or true value. Usually expressed in terms of percent recovery.
- Representativeness: A qualitative judgment, which refers to a sample or group of samples that reflects the characteristics of the media at the sampling point. Representativeness also includes how well the sampling point represents the actual parameter variations that are under study.
- Comparability: A qualitative judgment that expresses the confidence with which one data set can be compared to another.
- Completeness: The amount of valid data obtained from a measurement system compared to the amount that was expected and necessary to obtain to meet the project data goals.

The precision and accuracy goals for the analyses of target compounds are expressed as relative percent differences (RPDs) and percent recoveries, respectively, and are described in *Sections 6.3.1* and *6.3.2* of this QAPP.

Comparability and representativeness of all samples will also be ensured through the use of established field and laboratory procedures and their consistent application.

## SECTION 3

# QUALITY CONTROL

This section presents QC requirements relevant to analysis of environmental samples that will be followed during all project analytical activities. The purpose of the QC program is to produce data of known quality that satisfy the project objectives and that meet or exceed the requirements of the standard methods of analysis. This program provides a mechanism for ongoing control and evaluation of data quality measurements through the use of QC materials. The revised RAW provides summaries and references for the field tasks to be performed during the investigation.

### 3.1 QUALITY CONTROL PROCEDURES

The metal and organic compound data collected from Revised RAW confirmation samples will be used to determine if the initial removal meets the Revised RAW objectives or if additional step-out excavations need to be conducted. As such, it is critical that the chemical data be reliable and of the highest quality. Consequently, strict QC procedures will be adhered to. These procedures include:

- Adherence to strict protocols for field sampling and decontamination procedures
- Collection and laboratory analyses of appropriate field blanks to monitor for contamination of samples in the field or laboratory
- Collection and laboratory analyses of matrix spike, matrix spike duplicate, and field duplicate samples to evaluate analytical precision and accuracy
- Attainment of completeness goals

#### 3.1.1 SAMPLE COLLECTION METHODS

Sample collection methods that will be used for field activities performed during the excavation confirmation soil sampling are described in the Revised RAW. Media to be sampled will consist of soil only. Concrete with PCBs will be removed entirely as it is not cost effective to separate the 8-inch thick concrete into layers. Sampling techniques and appropriate sampling equipment established in USEPA references such as Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846 (USEPA, 2008) will be used.

Samplers will don clean, nitrile (or equivalent) disposable gloves at each sampling location. The procedure will minimize the possibility of cross-contamination or unnecessary loss of contaminants in the samples.

#### 3.1.2 EQUIPMENT DECONTAMINATION

Non-dedicated equipment will be decontaminated before and after each sample collection. Decontamination during non-PCB sampling will be performed using steam pressure-wash for large sampling equipment and triple-rinse procedures for hand tools/sampling equipment. The triple-rinse procedures consist of immersing and scrubbing the tools/equipment in a non-phosphate detergent solution, rinsing in tap water, rinsing in distilled VOC-free water, followed by air drying. Decontamination for excavations with PCB sampling will be conducted using hexane. Decontamination procedures are further detailed in the Revised RAW.



### 3.1.3 STANDARDS

Standards used for calibration or to prepare samples will be certified by National Institute of Standards and Technology (NIST), USEPA, or other equivalent authorities. The standards will be current. The expiration date will be established by the manufacturer, or based on chemical stability, possibility or signs of contamination, and environmental and storage conditions. Standards will be labeled with expiration dates, and will reference the primary standard sources, if applicable. Expired standards will be discarded.

### 3.1.4 SUPPLIES

All supplies will be inspected prior to their use in the field or laboratory. The descriptions for sample collection and analysis contained in the SW-846 methods will be used as a guideline for establishing the acceptance criteria for supplies. A current inventory and appropriate storage system for these materials will assure their integrity prior to use. Efficiency and purity of supplies will be monitored through the use of standards and blank samples.

### 3.1.5 HOLDING-TIME COMPLIANCE

Soil sample preparation and analysis will be completed within the required method holding time based on the analytes and sample matrix. The holding times for the analytical methods to be utilized for soil are provided in Table 3-1.

**Table 3-1**  
**Soil Sample Holding Time**

Analyte	USEPA Method(s)	Holding Time
Individual Metals	6010	6 months
Mercury	7471A	28 days
PCBs	Soxhlet extraction: 3540C Analysis: 8082	14 days for extraction; 40 days for analysis
PAHs	8310	14 days for extraction; 40 days for analysis
TPH-diesel and TPH-motor oil	8015B	14 days for extraction; 40 days for analysis
TPH-gasoline	Collection: 5035 Analysis: 8015B	48 hours extraction/ 14 days for analysis
Dioxin and Furan 2,3,7,8-TCDD	8280A	30 hours extraction/ 45 days for analysis

Notes: USEPA – U.S. Environmental Protection Agency  
PAH – polycyclic aromatic hydrocarbon  
PCB – polychlorinated biphenyl  
TPH – total petroleum hydrocarbons

Holding time begins at the time of sample collection. If holding times are exceeded but the analyses are performed, the analytical results will be qualified as described in the applicable validation procedure. The following definitions of extraction and analysis compliance are used to assess holding times:

- Preparation or extraction completion: completion of the sample preparation process as described in the applicable method, prior to any necessary extract cleanup
- Analysis completion: completion of all analytical runs, including dilutions, second-column confirmations, and any required re-analyses

### 3.1.6 PREVENTATIVE MAINTENANCE

The Revised RAW field manager is responsible for documenting the maintenance of all field equipment (e.g. dust monitor, photo-ionization detector, etc.) as prescribed in the manufacturer's specifications. Trained personnel will perform scheduled maintenance of the field equipment. The analytical laboratory is responsible for all analytical equipment calibration and maintenance as described in their laboratory QA/QC Plan. Subcontractors are responsible for calibration and maintenance of all equipment needed to carry out their respective duties.

## 3.2 QUALITY CONTROL SAMPLES

Both field and laboratory QA/QC samples will be collected to evaluate the performance of the field and analytical procedures. QA/QC samples will be analyzed along with Site samples to enable the evaluation of field sampling and analytical accuracy and precision.

### 3.2.1 FIELD QUALITY CONTROL SAMPLES

The field quality control samples to be collected by field personnel include field duplicates, equipment blanks (EBs), field blanks, and temperature blanks. Field duplicates will be used to calculate the precision of the field sampling and analytical procedures (see *Section 6.3.1*). EBs will be collected by the sampling team to assess if contaminants are introduced into the sampling train during sample collection. Field blanks will be used to assess the potential for field contamination. Temperature blanks will be used to ensure that samples remain at 4 degrees Celsius (°C)  $\pm 2^{\circ}\text{C}$  to for proper sample preservation. Details regarding the frequency with which these samples should be collected and the analyses that should be performed for each are described below.

**Field Duplicates.** Field duplicate samples will be collected for soil confirmation samples, not soil stockpile samples for offsite disposal. Soil duplicate samples will be co-located with Site samples and will be collected from the identical depth whenever possible to maximize sample similarity.

For each matrix, field duplicates will be collected at a frequency of 10% of the primary sample population. Each duplicate will be analyzed for the same parameters as its corresponding Site ("parent") sample. Field duplicate samples will be submitted to the laboratory "blind" and will be assigned unique sample identification numbers. The "blind" duplicate soil samples will be obtained from immediately adjacent sampling area within the same sampler whenever possible and will be recorded on the daily field reports.

**Equipment Blanks (EB).** EBs will be collected when reusable, non-disposable sampling equipment is used. To prevent cross-contamination of samples, all field sampling equipment must be decontaminated prior to reuse. The EB evaluates the success of the equipment decontamination practices. Soil sampling equipment blanks will consist of distilled water that has been passed through/over the reusable equipment (e.g., excavation bucket, hand trowel). One EB will be collected at the end of each day. EBs will be analyzed for the same parameters as the Site samples collected that day.

**Field Blanks.** Field blanks will be collected each day during sampling. A field blank consists of a sample of analyte-free water poured into a preserved container in the field and shipped to the laboratory with the rest of the Site samples. Field blanks are exposed to the same field conditions as the Site samples and will be analyzed for the same parameters as the Site samples collected that day.

**Temperature Blanks.** The laboratory will provide temperature blanks (TB). Temperature blanks will accompany each cooler of samples shipped to the analytical laboratory(s). The temperature of the water in

the temperature blanks will be recorded upon arrival at the laboratory(s) to determine if the sample temperatures deviate from  $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$ .

### 3.2.2 LABORATORY QUALITY CONTROL SAMPLES

The laboratory QA analyses represent at least 10 percent of the total number of the analyses performed. Each laboratory will analyze the following laboratory QC samples: method blanks (MBs), laboratory control samples (LCSs), matrix spike/matrix spike duplicates (MS/MSDs), and surrogate spikes. Method blanks will be used to identify any background interference or contamination that may be introduced into the samples from the laboratory. LCSs, MS/MSDs, and surrogate spikes will be used to determine the presence of any matrix or sample preparation interference and to determine the accuracy and precision of the analyses. An aliquot of the field sample will be used for the laboratory QC samples (MS/MSDs and surrogate spikes) for soil.

**Method Blank.** A MB consists of reagent grade water that is extracted by the laboratory and analyzed as a sample. Analysis of the MB indicates potential sources of contamination from laboratory procedures (e.g., contaminated reagents, improperly cleaned laboratory equipment, or persistent contamination due to presence of certain compounds in the ambient laboratory air). One MB is included with each preparation batch (not to exceed 20 samples) or with each type of sample matrix, whichever is more frequent. The MB will be taken through the entire sample preparation process and then analyzed for the same analytes as the samples to which it corresponds.

**Laboratory Control Samples.** A LCS is defined as a blank in-house matrix (i.e., solid, gas, or liquid) spiked with a known amount of analyte. The spiking solution is prepared independently of the calibration standards. Spiking solutions are used to establish the possibility of matrix interference. The LCS is analyzed for the spiking compound.

**Matrix Spike/Matrix Spike Duplicates.** MS samples are analyzed by the laboratory to evaluate the efficiency of the sample extraction and analysis procedures, and are necessary because matrix interference may have a wide varying impact on the accuracy and precision of the extraction and analysis. MS samples are usually performed in duplicate in order to evaluate the precision of the procedures as well as the accuracy. The MS and MSD are prepared by the addition of known quantities of target compounds to a field sample. The spiked samples are then extracted and analyzed as normal field samples. The results of the analysis are compared with the known additions and the percent recovery is calculated, giving an evaluation of the accuracy of the extraction and analysis procedures. MS/MSD recoveries are reviewed to check that they are within an acceptable range; however, the acceptable range could vary widely with both sample matrix and analytical method. Precision objectives (represented by agreement between MS and MSD recoveries) and accuracy objectives (represented by MS and MSD recovery results) are based on statistically generated limits established annually by the analytical laboratory. It is important to note that these objectives are to be viewed as goals, not as criteria. MS/MSD will be analyzed by the laboratory at a frequency of at least one per 20 field samples, or 5% of the primary field samples.

**Surrogates.** For many methods, surrogate compounds are added to every sample at the beginning of sample preparation and are used to monitor the analytical process and give information concerning possible matrix effects. Surrogate recoveries are the single most useful QC entity for evaluating environmental analytical data. The ubiquitous use of surrogates in analytical methods has afforded a large database of results from which useful correlated information can be obtained. Surrogates are chemically similar to target analytes and their recovery within control limits indicates the process is in control. Surrogates are the primary indicators of matrix effects.

### **3.2.3 INTERNAL STANDARDS**

Internal standards are measured amounts of method-specified compounds added after preparation, or extraction, of a sample. Internal standards are added to field samples, control samples, and blanks in accordance with method requirements to identify column injection losses, purging losses, or viscosity effects.

Acceptance limits for internal standard recoveries are set forth in the applicable method. If the internal standard recovery falls outside of acceptance criteria, the instrument will be checked for malfunction and the corrective action will be in accordance with the method and the laboratory's QA/QC Manual.

### **3.2.4 RETENTION TIME WINDOWS**

Retention time windows will be established as described in SW-846 for applicable analyses of organic compounds. Retention time windows are used for qualitative identification of analytes and are calculated based on multiple, replicated analyses of a standard.

Retention times will be checked daily. Acceptance criteria for retention time windows are established in the referenced method. If the retention time falls outside the respective window, actions will be taken to correct the problem.

### **3.2.5 INSTRUMENT CALIBRATION**

Analytical instruments will be calibrated in accordance with the procedures specified in the applicable method. All analytes reported will be present in the initial and continuing calibrations, and these calibrations must meet the acceptance criteria specified in the reference method. Records of standard preparation and instrument calibration will be maintained by the laboratory(s). Records will unambiguously trace the preparation of standards and their use in calibration and quantification of sample results. Calibration records will be traceable to standard materials.

At the onset of analysis, instrument calibrations will be checked using all of the analytes of interest. This applies equally to multi-response analytes. At a minimum, calibration criteria will satisfy method requirements. Analyte concentrations can be determined with either calibration curves or response factors, as defined in the method. Guidance provided in SW-846 should be considered to determine appropriate evaluation procedures.

## **3.3 FIELD VARIANCES**

As conditions in the field may vary, it may become necessary to implement minor modifications from the Revised RAW. Field personnel will notify the EC and EMD PM when deviations from the Revised RAW are necessary. When appropriate, the DTSC POC will be notified of the deviations and verbal approvals will be obtained before implementing the deviations, unless it is an emergency situation (e.g., limit excavations due to building structural integrity). Deviations from the approved Revised RAW will be documented in the field logs and in the final report.

## SECTION 4

# SAMPLE HANDLING AND CUSTODY

Sample custody procedures will be followed through sample collection, transfer and shipment, analysis, and disposal to ensure that the integrity of the samples is maintained.

### 4.1 FIELD PROCEDURES

Collection of environmental samples of high integrity is important to the quality of the data to be generated. To this end, strict field procedures have been developed that will be used during the Revised RAW implementation. These procedures are detailed in the Revised RAW.

The laboratory will purchase method-appropriate containers commercially from an equipment supplier, or other equivalent sources. Upon collection, soil samples will be preserved according to the following protocols in the table below.

**Table 4-1**  
**Soil Sample Containers and Preservation Methods**

Analyte	USEPA Method	Sample Containers	Preservation Method
Individual Metals	6010B	New 4 ounce glass jar with Teflon-lined cap or new 2-inch diameter, 3-inch long stainless steel sleeves with Teflon sheeting and plastic end caps. Sample volumes will be determined based upon total analyses required.	4 °C
Mercury	7471A		4 °C
PCBs	Extraction: 3540C Analysis: 8082		4 °C
PAHs	8310		
TPH-diesel C <sub>9</sub> -C <sub>25</sub> and TPH-motor oil C <sub>24</sub> -C <sub>40</sub> with carbon chain speciation	8015B		
Dioxin and furan congeners 2,3,7,8-TCDD	8280A		
TPH-gasoline C <sub>6</sub> -C <sub>12</sub>	Collection: 5035 Analysis: 8015B	Either three Encores™ or Terracores kits with pre-preserved VOA vials	

Notes:

°C – degrees Celsius

PAHs – polycyclic aromatic hydrocarbons

PCBs – polychlorinated biphenyls

TPH – total petroleum hydrocarbons

USEPA – United States Environmental Protection Agency

### 4.2 SAMPLE HANDLING

Samples are identified by a sample label affixed to the sample container. The information on the sample label will include the following information:

- Project identifier
- Field sample identification number
- Date and time of sample collection
- Name or initials of the sampler

- Sample matrix type and depth, as appropriate, at which the sample was obtained
- Analyses to be performed on the sample

All soil samples will be stored on ice in an insulated cooler immediately after being collected. All samples will be packaged carefully in this insulated cooler to avoid contamination, and will be delivered to the laboratory at proper temperature. The following sample packaging requirements will be followed:

- All sample containers will be stored in a chilled cooler
- A temperature blank will accompany each cooler being delivered to the laboratory(s)
- The chain-of-custody (COC) record will accompany the samples

Samples will be delivered to the laboratory within 24-hours of sample collection by either courier or via FedEx shipping.

Upon receipt of the samples by the laboratory(s), the integrity of the shipping and sampling container will be checked. Sample-related data will be noted on laboratory COC sheets. Upon receipt of the soil samples, the laboratory will immediately notify the field manager and EC PM if conditions or problems are identified that require immediate resolution. Such conditions include container breakage, missing or improper COC forms, exceeded holding times, missing or illegible sample labels, or temperature exceedences.

Samples received by the laboratory(s) will be placed in a sample refrigerator that is maintained at 4°C. All samples will remain in this environment to ensure sample integrity until analytical and validated QA results have been generated and reviewed. It should be noted that environmental samples whose holding times have expired may have limited usefulness.

### 4.3 SAMPLE CUSTODY IN THE FIELD

Sample custody is maintained by a chain-of-custody (COC) record. The COC record is completed by the individual collecting the sample. Information recorded on the COC form will include the following:

- Date the COC was filled out
- Page number and total number of pages
- Name and address of the laboratory where the samples will be sent for analysis
- Client's name and contact information (EMD PM will be listed)
- Project name
- Sampler's signature
- Field sample identification number/description
- Date and time the sample was taken
- Sample matrix type
- Type of sample container (e.g., glass jar/stainless steel sleeve)
- Number of sample containers
- Analyses required – the types and methods of analyses
- Relinquished by – the signature and printed name of the person giving up the samples
- Date and time – the date and time when the samples were relinquished
- Received by – the signature and printed name of the laboratory personnel who receives the samples
- Comments – any special instructions to the laboratory such as “Rush Turnaround” or other relevant information concerning the samples, including the number and type of laboratory QC samples collected (*Section 3.2.2*).

#### **4.4 TRANSFER OF CUSTODY**

The field personnel who collects the samples is responsible for the care and custody of the samples until it is properly transferred to the laboratory. All samples will be accompanied by a COC record. When transferring the possession of the samples, the individual relinquishing and receiving the samples will sign, date, and note the time on the COC record. This record documents the transfer of samples from the custody of the sampler to that of another person. The relinquishing individual will retain a copy of the COC record.

#### **4.5 SAMPLE CUSTODY IN THE LABORATORY**

A sample custodian will take custody of all samples upon their arrival at the laboratory. The sample custodian will inspect all sample labels and the COC record to ensure that the information recorded on each corresponds to one another. The sample custodian will also inspect all samples for signs of tampering or damage. Any discrepancies in information or signs of damage or tampering will be documented by the sample custodian. The laboratory will attach copies of the COC record to the analytical reports.

Upon receipt of the samples by the laboratory, sample-related data will be noted. The laboratory report will include details including discrepancies in sample condition upon arrival at the laboratory.

Each sample received by the laboratory will be given a discrete laboratory sample identification number to link the sample to the identity given by the sampler. The laboratory sample identification number will consist of a unique numbering system that enables each laboratory to accurately track the sample during preparation, analysis, QA/QC procedures, and final disposition.

The samples will be logged through the Laboratory Information Management System (LIMS). Relevant information specific to samples received by the laboratory will be recorded and will include the following information:

- Location code
- Work order number
- Login batch number
- Field sample identification number
- Date and time of sample collection
- All analytical methods requested
- Location within the laboratory of the samples

A laboratory sample identification number is automatically generated through the LIMS and the samples will be labeled with that identification. All sample transfers within the laboratory will also be recorded.

#### **4.6 CORRECTIONS TO THE FIELD LOGS AND OTHER DOCUMENTS**

All original data recorded in field logs/forms, on sample labels, or on COC records, as well as other data sheet entries, will be written with waterproof ink. If an error is made on a document or in the field logs, corrections will be made simply by crossing a line through the error in such a manner that the original entry can still be read, and the correct information added as the change. All corrections will be initialed by the author and dated.

## SECTION 5

# ANALYTICAL AND QUALITY CONTROL PROCEDURES

### 5.1 LABORATORY ANALYTICAL PROCEDURES

The analytical methods used for this project are listed in *Section 1.3*. Specific analytical method procedures are detailed in the laboratory QA/QC manuals. The PM's quality assurance staff may review these documents during laboratory audits to ensure that project specifications are met. Analytical methods to be used for the sample analyses are detailed in Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846 (EPA, 2008). All guidelines and procedures specified in the analytical methods will be strictly adhered to. Deviations from those guidelines and procedures will be documented and immediately reported to the PM and/or QA/QC PM. If a deviation from the method renders the data unusable for its intended purpose, re-sampling and/or re-extraction and reanalysis may be required.

#### 5.1.1 DETECTION LIMITS

Detection limits are required for all methods of quantitative analysis to evaluate each method's performance. Detection limits for any analytical procedures depend on the matrix of the sample being tested. The MDL is the minimum concentration of an analyte or compound that can be measured and reported with 99% confidence when the concentration is greater than zero. MDLs are established for each method, matrix, and analyte. MDLs are derived using the procedures described in Title 40, Code of Federal Regulations, Part 136 (EPA, 2008). The EPA requires that MDLs be established on an annual basis. MDLs for each target analyte in soil will be provided upon selection of the project laboratory(s) and will be the same if not lower than the MDLs utilized in the previous site investigations (2006 Preliminary Endangerment Assessment and the 2007 and 2015/2016 Remedial Investigations). The MDLs are the minimum expected values, but they may vary based on sample variables (i.e., mass, moisture, and dilution).

#### 5.1.2 QUANTITATION LEVELS

All soil analytes have an established practical quantitation limit (PQL), which is validated by having the level of the PQL included as one level in the multilevel calibration curve and is at or below the low standard in the calibration curve. Any concentrations reported at or above the PQL are considered quantitated data of known precision and accuracy, in contrast to concentrations reported below the PQL, which are considered estimated values.

### 5.2 LABORATORY QUALITY CONTROL PROCEDURES

The following USEPA-recommended laboratory quality control procedures will be used for the investigation at the Site:

- Standard USEPA analytical methods will be used for the sample analyses as referenced in Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, (USEPA, 2008)
- Proper calibration of analytical instruments shall be performed
- Laboratory QC samples shall be analyzed (see *Section 3.2.2*)

Analytical instruments shall be calibrated regularly using USEPA- or NIST-traceable standards in accordance with the specified analytical methods.



## SECTION 6

# DATA QUALITY MANAGEMENT AND REPORTING

Data quality management will be the responsibility of the EC PM, the EC QA/QC PM, and the laboratory(s). The following sections summarize the data management, data validation, and data QA/QC procedures required for the Revised RAW implementation. This section also presents reporting requirements relevant to the analysis data produced during this project.

### 6.1 DATA MANAGEMENT

Data measured by field instruments will be recorded in field notebooks, laptops, and/or on required field forms. Units of measure for field analyses are identified with the recorded measurement. The field data will be reviewed by the EC PM or EC QA/QC PM to evaluate completeness of the field records and appropriateness of the field methods employed. All field records will be retained in the project files.

#### 6.1.1 FIELD LOGS

All field personnel will maintain daily field logs with consecutively numbered pages. The field logs and associated forms will include, but not be limited to the following information:

- Date and time for each field log entry
- Time of Site arrival and departure for staff, subcontractors, and Site visitors
- Names and affiliations of personnel on the Site
- General description of each day's field activities
- Documentation of weather conditions during sampling
- Sample location descriptions (e.g., excavation number)
- Photograph information (separate form)
- Observations of sample collection environment (e.g., color)
- Equipment calibration data (separate form)
- Results of any field measurements (e.g., ambient air monitoring)
- Field samples collected including QA/QC samples (EB, duplicate)
- Levels of safety protection
- Deviations from the Revised RAW, HASP, or QAPP procedures
- Changes in personnel and responsibilities, along with reasons for the changes

#### 6.1.2 LABORATORY DATA

The laboratory will use their USEPA-approved Data Management System. Data storage and documentation at the laboratories will be maintained using logbooks and data sheets that will be kept in permanent files. All computer-generated raw data will be stored on compact disc or other media and will be maintained, along with paper copies by the laboratories.

The laboratory will provide electronic data deliverables (EDDs) in project-specific format for use in data analyses by the EC. An electronic copy will be sent to the EC PM who will forward to the EMD PM within two weeks of sample analysis in summary format.

Analytical data reporting packages will contain the necessary sample results and quality control data to evaluate the DQOs defined for the project. Laboratory report packages will include the following data and summary forms:

- The original signed COC form showing the date and time when the samples were received
- A cross-reference to correlate field sample IDs to laboratory sample IDs
- A cross-reference to correlate applicable laboratory QC samples with associated field samples
- A glossary defining the symbols and terms used in the laboratory report
- Sample collection date, sample receiving temperature, sample extraction/preparation dates, and sample analysis dates
- A list of the MDLs and PQLs
- Analysis data sheets for all field samples, blanks, MS/MSDs, and LCSs
- Method blank summary reports that identify all related field samples, MS/MSDs, and LCSs
- Surrogate compound recovery reports with control limits for all field samples, blanks, MS/MSDs, and LCSs
- Matrix spike/matrix spike duplicate recovery reports with control limits
- LCS recovery reports with control limits

## 6.2 DATA VALIDATION

Once the samples have been analyzed by the laboratory(s), data validation will be conducted under the direction of the QA/QC PM in accordance with USEPA guidelines.

### 6.2.1 DATA REVIEW

The QA/QC Program Manager will conduct a data review of the following to determine the validity of the analytical data:

- Data completeness
- Holding times
- Calibrations
- Blanks
- LCSs
- MS/MSDs
- Surrogates/internal standards (as applicable)
- Field quality control samples
- Compound identification and quantitation

The criteria and requirements used to evaluate each of these metrics is given in *Section 3.2* of this QAPP.

### 6.2.2 DATA REVIEW QUALIFIERS AND DESCRIPTORS

Data that is unusable or only usable under certain circumstances is assigned a qualifier (e.g., “R”) by the QA/QC PM which includes data collected when significant performance requirements were not met during sample collection and analysis. Based on the results of the data review, the following qualifiers and descriptors will be assigned as coefficients to the data that fail QC criteria:

- U Analyzed, but was not reported above the method detection limit (MDL).
- J The analyte was positively identified and concentration is above the MDL, but below the PQL. It may not represent the actual limit necessary to accurately and precisely measure the analyte in the sample and is considered an estimated value.

- UJ The analyte was not reported above the MDL. However, the reported detection limit is approximate and may or may not represent the actual limit necessary to accurately and precisely measure the analyte in the sample.
- B The environmental sample result is less than five times or ten times (for common laboratory contaminants such as acetone, 2-butanol, methylene chloride) the MB concentration.
- R The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

The following descriptors will be used for any situation where qualification was deemed necessary:

- a Analyte was found in the MB
- c MS/MSD outside control limits
- d LCS outside control limits
- e Holding time violation occurred
- n Laboratory care narrative related issue(s)
- t Temperature blank outside acceptance criteria

## 6.3 DATA QUALITY ASSESSMENT PROCEDURES

The EC PM will assess if the validated data is sufficient to support the DQOs of the Revised RAW. Unqualified results indicate that adequate QC was maintained during all sampling and analytical activities, and may be used without further inquiry. The QA/QC PM will assess the accuracy, precision, and completeness of the analytical data using the calculations provided below (*Sections 6.3.1 through 6.3.3*).

### 6.3.1 PRECISION

Duplicate results are assessed using the RPD between duplicate measurements. If the RPD for laboratory quality control samples exceeds the statistically determined control limit, the data will be qualified as described in the applicable validation procedure. If the RPD between primary and duplicate field samples exceeds 40% the data will be qualified as described in the applicable validation procedure. The RPD will be calculated as follows:

$$\%RPD = 100 \times \frac{X_2 - X_1}{(X_2 + X_1)/2}$$

where  $X_2$  is the larger of the two observed values, and  $X_1$  is the smaller of the two observed values.

### 6.3.2 ACCURACY

Accuracy is expressed as percent recovery. The calculation for percent recovery is:

$$\%R = 100 \times \frac{X_s - X}{T}$$

where  $X_s$  is the measured value of the spiked sample,  $X$  is the measured value of the unspiked sample, and  $T$  is the true value of the spike solution added.

### 6.3.3 COMPLETENESS

The completeness of the data will be evaluated based on the percentage of valid data relative to the total tests requested. It is calculated according to the following formula:

$$\%Completeness = 100 \times \frac{N_V}{N_E}$$

where  $N_V$  is the number of valid results and  $N_E$  is the number of expected results.

## SECTION 7

# QUALITY ASSURANCE OVERSIGHT

QA oversight is conducted to ensure that the QAPP and Revised RAW are implemented as required and measurement activities are producing results that meet the DQOs for the Revised RAW. This section describes responsibilities, requirements, and methods for scheduling, conducting, and documenting audits of field and laboratory activities.

### 7.1 AUDITS

A QA audit is an independent assessment of a measurement system. The objective of an audit is to verify, by examination and evaluation of objective evidence, whether elements of the Revised RAW and QAPP have been effectively implemented. The analytical laboratories are audited routinely by the USEPA.

There are two types of audits: a system audit, which verifies adherence to standard operating procedures and QA policies, and a performance audit, which measures the ability to achieve measurement data that are comparable to a standard of reference.

#### 7.1.1 SYSTEM AUDITS

Periodic audits of the field activities of both the EC staff and subcontractors will be performed by the EC QA/QC PM. The audits will be conducted as soon as possible after a project phase begins. The function of the field QA audit will be to:

- Observe procedures and techniques used in the various measurement efforts, including field sampling and analysis
- Check and verify that instrument and sampling equipment calibration records are in place
- Assess the effectiveness of and adherence to prescribed QA procedures
- Review document control and COC procedures including the completion of the COC records
- Review the completeness of field logs
- Review any nonconformance reporting procedures
- Identify any weakness in the sampling/analytical approach and techniques
- Assess the overall data quality of the various sampling and analytical systems employed at the time of the audit

The results of the audit will be prepared and provided to the EC PM detailing the overall system performance and deficiencies, plus any recommendations for corrective action. The field audit report may include the following elements detailing the status of the system data quality:

- Activities and general program status
- Field equipment calibration and QC problems
- Corrective action activities
- Status of any unresolved problems
- Assessment and summary of data completeness
- Significant QA/QC problems and recommended and/or implemented solutions
- A quality deficiency notice when nonconformance occurs with QA/QC procedures.

### **7.1.2 LABORATORY PERFORMANCE AUDITS**

Internal performance audits of the laboratories will consist of submitting blind field duplicate samples to the analytical laboratories. The RPD for field duplicate sample results will be compared to the RPD of the MSDs. Corrective actions will be initiated if there are gross differences between the RPDs of field duplicates and MSDs that cannot be explained due to matrix considerations. The results of the performance audit will be prepared detailing the overall system performance and deficiencies, plus any recommendations for corrective action. The QA/QC and EC PM will discuss the audit findings with the laboratory and seek corrective actions. The laboratory performance audit report may include the following elements:

- Laboratory activities and general program status
- Calibration and QC problems
- Corrective action activities
- Status of any unresolved problems
- Assessment and summary of data completeness
- Significant QA/QC problems and recommended and/or implemented solutions

### **7.2 CORRECTIVE ACTION**

The need for corrective action may be identified during sampling, the review of field and laboratory data, audits, and safety and health surveillance. Corrective action is required when procedures or programs are not followed and when circumstances result in the questionable quality of activities, measurements, samples, or data.

All project personnel are responsible for identifying problems that require corrective action. When items are identified that require corrective action, they are to be immediately corrected by the individual noting the problem. The actions taken will be documented in the individual's field log. When a situation is identified that cannot be resolved immediately, or when the condition observed may result in questioning the data or samples that were previously collected, a formal corrective action request (CAR) is to be prepared and submitted to the EC PM and/or QA/QC PM. The QA/QC Program Manager will verify any required corrective action as complete and effective.

The type and level of corrective action for laboratory activities will depend on the degree of nonconformity. The selected laboratory Director and project personnel will be notified if corrective actions are necessary.

### **7.3 QUALITY ASSURANCE REPORTS**

The QA/QC PM will prepare a data validation report summarizing the data quality information including the duplicate performance audit, which will be included in the Revised RAW Completion Report. An evaluation will be conducted to determine whether the DQOs for the Revised RAW have been met. In addition, any significant QA problems encountered in the field or laboratory and the correction actions implemented will be included in the Revised RAW completion report.

## **SECTION 8 REFERENCES**

Environmental Protection Agency (USEPA), 2000. US EPA – Region III Guide for preparing a Generic Quality Assurance Project Plan for a State RCRA Subtitle C or LUST or UST Program. October.

\_\_\_\_\_, 2001. EPA Requirements for Quality Assurance Project Plans. Document Number EPA QA/R-5. March.

\_\_\_\_\_, 2002. Guidance for Quality Assurance Project Plans. Document Number EPA QA/G-5. December.

\_\_\_\_\_, 2006. Guidance on Systematic Planning Using the Data Quality Objective Process. Document Number EPA QA/G-4. February.

\_\_\_\_\_, 2008. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846. Third Edition. Final Update IV. January 3.

**APPENDIX B**  
Site Specific Import Fill Criteria



## Former San Pedro Boat Works Import Fill Criteria

Imported fill must consist of native soil be obtained from a mining area or rock quarry. No industrial material such as crushed base may be utilized. One discrete sample per 250 cubic yards of borrow material will be collected for metal and organic analyses listed below.

Chemical of Concern and Analytical Method	Import Fill Criteria mg/kg	Site Cleanup Goal mg/kg	Background Threshold Value mg/kg	POLA Industrial- Use Fill Material mg/kg	SFRWQCB Residential ESL mg/kg
Volatile Organic Compounds (EPA Method 8260/5035 collection)	All ND	NA	NE	various	various
Asbestos (Polarized Light Microscopy by OSHA ID-191)	ND	NA	NE	ND	NE
<b>Total Petroleum Hydrocarbons (TPH) by EPA Method 8015M/ Sample collection EPA 5035 for TPH-gasoline</b>					
TPH Gasoline Range (C5-C9 / C7-C12 / C6-C12)	180	180	NE	180	100
TPH Diesel Range (C10-C25 / C13-C22 / C9-C25)	180	180	NE	180	230
TPH Motor Oil (C25-C36 / C23-C36 / C24-C40)	1,700	1,700	NE	NE	5,100
<b>Heavy Metals (EPA Method 6010/6020/7417A)</b>					
Antimony	30	30	1.03	40	31
Arsenic	12	12	12.5	8.7	0.067
Barium	210.2	NA	210.2	1,000	15,000
Beryllium	0.562	NA	0.562	7.5	150
Cadmium	1.4	NA	1.638	1.4	39
Chromium Total	35.86	NA	35.86	100	NE
Cobalt	8.4	NA	8.4	80	23.00
Copper	51.5	51.5	51.5	69	3,100
Lead	50	50	13.25	50	80
Mercury	0.69	0.69	0.424	0.69	13
Molybdenum	4.4	NA	7.355	4.4	390
Nickel	47.86	NA	47.86	200	820
Selenium	0.23	NA	4.88	0.23	390
Silver	0.43	NA	0.43	3.75	390
Thallium	0.95	NA	ND	0.95	0.78
Vanadium	42.04	NA	42.04	200	390
Zinc	99	99	99.39	680	23,000

### Notes:

NA = Not applicable

NE = not established

If asbestos is detected at <1% by Polarized Light Microscopy, then reanalyze by 1000 Point Count Method (PCM). If ACM is less than 0.1% by PCM, then fill can be accepted

ND = not detected below laboratory method detection limit in which dilution factor is 1 or less.

Highlighted cells are selected for import fill criteria.

### References:

Background Threshold Values, Remedial Investigation Report Addendum, Tetra Tech, February 10, 2009

POLA Industrial-Use Fill Material, "Environmental Guidance for Industrial Use Soil, City of Los Angeles Harbor Department, February 2016

San Francisco Regional Water Quality Control Board (SFRWQCB) Environmental Screening Levels, February 2016

**APPENDIX C**  
USEPA Standard Operating Procedure for  
Sampling Porous Surfaces for  
Polychlorinated Biphenyls (PCBs)

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**

**Region 1**

**5 Post Office Square, Suite 100**

**Boston, MA 02109-3912**

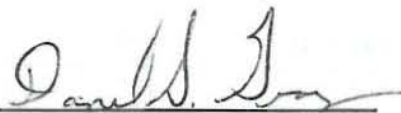


**STANDARD OPERATING PROCEDURE FOR SAMPLING POROUS  
SURFACES FOR POLYCHLORINATED BIPHENYLS (PCBs)**

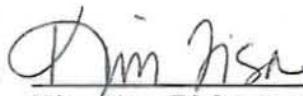
**May 2011**

**STANDARD OPERATING PROCEDURE  
FOR SAMPLING POROUS SURFACES  
FOR POLYCHLORINATED BIPHENYLS (PCBs)**

**The Office of Environmental Measurement and Evaluation  
EPA New England – Region 1  
11 Technology Dr.  
North Chelmsford, MA 01863**

Prepared by:   
Dan Granz, Environmental Engineer


5/5/11  
Date

Reviewed by:   
Kim Tisa, TSCA PCB Coordinator

5/5/11  
Date

Reviewed by:   
Jerry Keefe – EIA Team Leader

05/23/11  
Date

Approved by:   
Dan Boudreau, EIA Chemistry Team Leader

5/23/11  
Date

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### Attachments:

Example of Custody Seal and Sample Label

Example of Chain of Custody Form



## **1.0 Scope and Application**

- 1.1 This Standard Operating Procedure (SOP) is suitable for collection of a porous matrix sample for analysis of Polychlorinated Biphenyls (PCBs).
- 1.2 This SOP describes sampling techniques for both hard and soft porous surfaces.
  - 1.2.1 Hard surfaces, and most soft surfaces, can be sampled using an impact hammer drill to generate a uniform, finely ground, powder to be extracted and analyzed for PCBs. This procedure is primarily geared at providing enough sample quantity for two analyses. Hard porous surfaces include concrete, brick, asphalt, cement, sandstone, limestone, unglazed ceramics, and other possible PCB suspected material. This procedure may also be used on other softer porous surfaces, such as wood.
  - 1.2.2 Soft surfaces can be sampled using a chisel or sharp knife to generate a representative sample to be extracted and analyzed for PCBs. Soft porous surfaces include wood, wall plasterboard, low density plastics, rubber, caulking, and other PCB suspected material.
- 1.3 This SOP provides for collection of surface samples (0 – 0.5 inches) and delineation of PCB contamination throughout the core of the porous surface. The procedure can be used to sample the porous surface at distinctly different depth zones.

## **2.0 Method Summary**

A one-inch or other sized diameter carbide drill bit is used in a rotary impact hammer drill to generate a fine powder, or other representative sample, suitable for extraction and analysis of PCBs from porous surfaces. This method also allows the use of chisels or knives for the collection of samples from soft porous surfaces for PCB analysis.

## **3.0 Definitions**

- 3.1 Field/Bottle Blank: A sample container of the same lot as the containers used for the environmental samples. This evaluates PCB contamination introduced from the sample container(s) from a common lot.
- 3.2 Equipment/Rinse/Rinsate Blanks: A sample that is collected by pouring hexane over the sample collection equipment after decontamination and before sample collection. The sample is collected in the appropriate sample container identical to the sample containers. This represents background contamination resulting from the field equipment, sampling procedure, sample container, and shipment.

- 3.3 Field Replicates/Duplicates: Two or more samples collected at the same sampling location. Field replicates should be samples collected side by side. Field replicates represent the precision of the whole method, site heterogeneity, field sampling, and the laboratory analysis.
- 3.4 Field Split Samples: Two or more representative subsamples taken from one environmental sample in the field. Prior to splitting, the environmental sample is homogenized to correct for sample heterogeneity that would adversely impact data comparability. Field split samples are usually analyzed by different laboratories (interlaboratory comparison) or by the same laboratory (intralaboratory comparison). Field splits are used to assess sample handling procedures from field to laboratory and laboratory comparability.
- 3.5 Laboratory Quality Samples: Additional samples that will be collected for the laboratory's quality control program: matrix spike, matrix spike duplicate, laboratory duplicates, etc.
- 3.6 Proficiency Testing (PT)/Performance Evaluation (PE) Sample: A sample, the composition of which is unknown to the laboratory or analyst, provided to the analyst or laboratory to assess the capability to produce results within acceptable criteria. This is optional depending on the data quality objectives. If possible, it is recommended that the PE sample be of similar matrix as the porous surface(s) being sampled.
- 3.7 Porous Surface: Any surface that allows PCBs to penetrate or pass into itself including, but not limited to, paint or coating on metal; corroded metal; fibrous glass or glass wool; unglazed ceramics; ceramics with porous glaze; porous building stone such as sandstone, travertine, limestone, or coral rock; low density plastics such as Styrofoam and low density polyethylene; coated (varnished or painted) or uncoated wood; painted or unpainted concrete or cement; plaster; plasterboard; wallboard; rubber; caulking; fiberboard; chipboard; asphalt; or tar paper.
- 3.8 Shipping Container Temperature Blank: A water sample that is transported to the laboratory to measure the temperature of the samples in the cooler.
- 4.0 Health and Safety**
- 4.1 Eye, respiratory, and hearing protection are required at all times during sample drilling. A properly fitted respirator is required for hard porous surface sampling. A respirator is recommended whenever there is a risk of inhalation of either particulate or volatilized PCBs during sampling.
- 4.2 All proper personal protection clothing and equipment must be worn.



4.3 When working with potentially hazardous materials or situations, follow EPA, OSHA, and specific health or safety procedures.

4.4 Care must be exercised when using an electrical drill and sharp cutting objects.

## **5.0 Interferences and Potential Problems**

5.1 This sampling technique produces a finely ground uniform powder, which minimizes the physical matrix effects from variations in the sample consistency (i.e., particle size, uniformity, homogeneity, and surface condition). Matrix spike analysis of a sample is highly recommended to monitor for any matrix related interferences.

5.2 Nitrile gloves are recommended. Latex gloves must not be used due to possible phthalate contamination.

5.3 Interferences may result from using contaminated equipment, solvents, reagents, sample containers, or sampling in a disturbed area. The drill bit must be decontaminated between samples. (see Section 11.0.)

5.4 Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment.

## **6.0 Personnel Qualifications**

6.1 All field samplers working at hazardous materials/waste sites are required to take a 40 hour health and safety training course prior to engaging in any field activities. Subsequently, an 8 hour refresher health and safety course is required annually.

6.2 The field sampler should be trained by an experienced sampler before initiating this procedure.

6.3 All personnel shall be responsible for complying with all quality assurance/quality control requirements that pertain to their organizational/technical function.

## **7.0 Equipment and Supplies**

7.1 This list varies with the matrix and if depth profiling is required

- Rotary impact hammer variable speed drill
- 1-inch or other suitable (1/2, 3/4, etc.) diameter carbide tip drill bits
- Steel chisel or sharp cutting knife, and hammer
- Brush and cloths to clean area
- Stainless steel scoopulas

Aluminum foil to collect the powder sample  
1 quart Cubitainer with the top cut out to collect the powder sample  
Aluminum weighing pans to collect the powder sample  
Cleaned glass container (2 oz or 40 mL) with Teflon lined cap  
Decontamination supplies: hexane, two small buckets, a scrub brush, detergent, deionized water, hexane squirt bottle, and paper towels  
Dedicated vacuum cleaner with a disposable filter or a vacuum pump with a dust filter  
Polyethylene tubing and Pasteur pipettes  
Sample tags/labels, custody seals, and Chain-of-Custody form

## 8.0 Sampling Design

8.1 A sufficient number of samples must be collected to meet the data quality objectives of the project. If the source of the PCB contamination is regulated under the federal TSCA PCB Regulations at 40 CFR Part 761, the sampler should insure that the sampling design is sufficient to meet any investigation or verification sampling requirements. At a minimum, the following is recommended:

8.1.1 Suspected stained area (s) should be sampled.

8.1.2 At each separate location, collect at least 3 samples of each type of porous surface, regardless of the amount of each type of porous surface present.

8.1.3 In areas where PCB equipment was used or where PCBs were stored, samples should be collected at a frequency of 1 sample/100 square feet (ft<sup>2</sup>).

## 9.0 Sample Collection

### 9.1 Hard Porous Surfaces

9.1.1 Lock a 1-inch or another size diameter carbide drill bit into the impact hammer drill and plug the drill into an appropriate power source. For easy identification, sample locations may be pre-marked using a marker or paint. (Note: the actual drilling point must not be marked.) Remove any debris with a clean brush or cloth prior to drilling. All sampling decisions of this nature should be noted in the sampling logbook.

9.1.2 Use a Cubitainer with the top cut off or aluminum foil to contain the powdered sample. Begin drilling in the designated location. Apply steady even pressure and let the drill do the work. Applying too much pressure will generate excessive heat and dull the drill bit prematurely. The drill will provide a finely ground powder that can be easily collected.



- 9.1.3 Samples should be collected at ½-inch depth intervals. Thus, the initial surface sample should be collected from 0 – 0.5 inches. A ½-inch deep hole generates about 10 grams (20 mL) of powder. Multiple holes located closely adjacent to each other, may be needed to generate sufficient sample volumes for a PCB determination. It is strongly recommended that the analytical laboratory be consulted on the minimum sample size needed for PCB extraction and analysis.
- 9.1.4 Wall and Ceiling Sampling: A team of two samplers will be required for wall and ceiling sampling. The second person will hold a clean catch surface (e.g. an aluminum pan) below the drill to collect the falling powder. Alternatively, use the chuck-end of the drill bit and punch a hole through the center of the collection pan. The drill bit is then mounted through the pan and into the drill. For ceilings, the drill may be held at an angle to collect the powder. Thus the driller can be drilling at an angle while the assistant steadies the pan to catch the falling powder. As a precaution, it may be advantageous to tape a piece of plastic around the drill, just below the chuck, to avoid dust contaminating the body of the drill and entering the drill's cooling vents. Caution must be taken to prevent obstruction of the drill's cooling vents.

## 9.2 Soft Porous Surfaces

- 9.2.1 The procedure for the hard porous surface may be used for certain soft porous surfaces, such as wood.
- 9.2.2 Samples should be collected at no more than ½-inch depth intervals using a metal chisel or sharp cutting knife. Thus, the initial surface sample should be collected from 0 – 0.5 inches. It is important to collect at least 10 grams for analysis.
- 9.2.3 For soft porous surfaces, such as caulking and rubber, a representative sample can be collected using a metal chisel or sharp cutting knife.

## 9.3 Multiple Depth Sampling

- 9.3.1 Multiple Depth Sampling may not be applicable to certain porous surfaces, such as caulking.
- 9.3.2 Collect the surface sample as outlined in Section 9.1 or 9.2.
- 9.3.3 Use the vacuum pump or cleaner to clean out the hole.
- 9.3.4 To collect multiple depths there are two options.

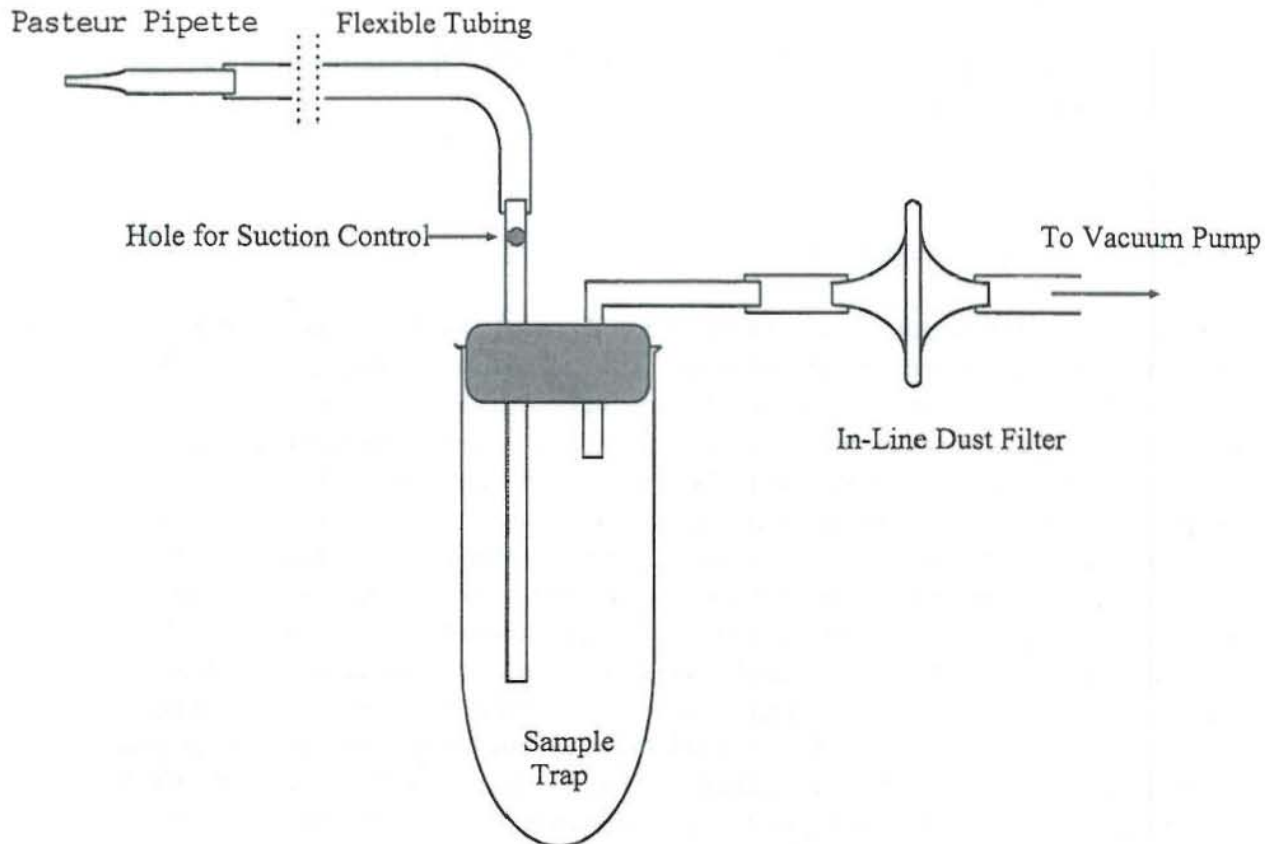
9.3.4.1 Option one: drill sequentially ½-inch increments with the 1 inch drill.

9.3.4.2 Option two: drill with the 1 inch bit and either make the hole larger or use a smaller bit to take the next ½- inch sample.

9.3.5 A stainless steel scoopula will make it easier to collect the sample from the bottom of the hole.

#### 9.4 Vacuum Trap Design and Clean-out

The trap presented in Figure 1 is a convenient and thorough way for collecting and removing concrete powder from drilled holes. The trap system is designed to allow for control of the suction from the vacuum pump and easy trap clean-out between samples. Note, by placing a hole in the inlet tube (see Figure 1), a finger on the hand holding the trap can be used to control the suction at the sampling tip. Thus, when this hole is left completely open, there will be no suction, and the sampler can have complete control over where and what to sample. To change-out between samples the following steps should be taken: 1) the Pasteur pipette and piece of polyethylene tubing at the sample inlet should be replaced with new materials, 2) the portion of the rubber stopper and glass tubing that was in the trap should be wiped down with a clean damp paper towel (wetted with deionized water) and then dried with a fresh paper towel, 3) a clean pipe cleaner should be drawn through the glass inlet tube to remove any concrete dust present, and 4) the glass tube or flask used to collect the sample should be swapped out with a clean decontaminated sample trap. Having several clean tubes or flasks on hand will facilitate change-out between samples.

**Figure 1**

Note: the holes should be vacuumed thoroughly to minimize any cross-contamination between sample depths and the bits should be decontaminated between samples. (See Section 11.0)

#### 10.0 Sample Handling, Preservation, and Storage

- 10.1 Samples must be collected in glass containers for PCB analyses. In general, a 2-ounce sample container with a Teflon-lined cap (wide-mouth jars are preferred) will hold sufficient mass for most analyses. A 2-ounce jar can hold roughly 90 grams of sample.
- 10.2 Samples are to be shipped refrigerated and maintained at  $\leq 6^{\circ}\text{C}$  until the time of extraction and analysis.
- 10.3 The suggested holding time for PCB samples is 14 days to extraction.



## **11.0 Decontamination**

- 11.1 Assemble two decontamination buckets. The first bucket contains a detergent and potable water solution, and the second bucket is for rinsate. Place all used drill bits, hose for the vacuum cleaner, and utensils in the detergent and water bucket. Scrub each piece thoroughly using the scrub brush. Note, the powder does cling to the metal surfaces, so care should be taken during this step, especially with the twists and curves of the drill bits. Next, rinse each piece with water and hexane. Place the rinsed pieces on clean paper towels and individually dry and inspect each piece. Note: all pieces should be dry prior to reuse.
- 11.2 Lightly contaminated drill bits and utensils may be wiped with a hexane soaked cloth and hexane rinsed for decontamination.

## **12.0 Data and Record Management**

- 12.1 All data and information collection should follow a Field Data Management SOP or Quality Assurance Project Plan (QAPP).
- 12.2 Follow the chain of custody procedures to release the samples to the laboratory. A copy is kept with the sampling records.
- 12.3 The field data is stored for at least 3 years.

## **13.0 Quality Control and Quality Assurance**

- 13.1 Representative samples are required. The sampler will evaluate the site specific conditions to assure the sample will be representative.
- 13.2 All sampling equipment must be decontaminated prior to use and between each discrete sample.
- 13.3 All field Quality Control (QC) sample requirements in a Sample and Analysis Plan (SAP) or QAPP must be followed. The SAP or QAPP may involve field blanks, equipment blanks, field duplicates and/or the collection of extra samples for the laboratory's quality control program.
- 13.4 Field duplicates should be collected at a minimum frequency of 1 per 20 samples or 1 per non-related porous matrix, whichever is greater.

## 14.0 Waste Management and Pollution Prevention

- 14.1 During field sampling events there may be PCB and/or hazardous waste produced from the sample collection. The waste must be handled and disposed of in accordance with federal, state, and local regulations. The dust filter, and tubing if a vacuum pump is used, is disposed after each site investigation. This waste will be treated as PCB waste if the samples are positive for PCBs. It may be possible to manage or dispose of the waste produced at the site where the work was performed. If the site does not meet regulatory requirements for these types of activities, the waste must be transported to a facility permitted to manage and/or dispose of the waste.


## 15.0 References

1. Guidance for the Preparation of Standard Operating Procedures for Quality-Related Operations, QA/G-6, EPA/600/R-96/027, November 1995.
2. 40 CFR Part 761 – Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution In Commerce, and Use Prohibitions
3. Sample Container and Holding Time: RCRA SW 846, Chapter 4, Table 4.1, Revision 4, February, 2007.

## Example of Sample Label and Custody Seal

U.S. ENVIRONMENTAL PROTECTION AGENCY – REGION I BOSTON, MASS.	
LABEL	NAME OF UNIT AND ADDRESS  ENVIRONMENTAL SERVICES DIVISION 60 WESTVIEW STREET LEXINGTON, MASSACHUSETTS 02173
	DATE: YR/MO/DAY
SAMPLE	TIME
	STATION NO.
	SOURCE OF SAMPLE
	SAMPLE NO.
	SUB NO.
	PRESERVATIVE
SAMPLING CREW (FIRST, INITIAL, LAST NAME)	
AMOUNT	
ANALYSIS	

 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY OFFICIAL SAMPLE SEAL	SAMPLE NO.	DATE
	SIGNATURE	
	PRINT NAME AND TITLE (Inspector, Analyst or Technician)	
SEAL BROKEN BY		DATE

EPA FORM 7500-2 (R7-75)





REGION 1

[illegible]

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

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